ENVIRONMENTAL ASSESSMENT

FOR THE

Pleasant Valley Timber Sale

PREPARED BY

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Management Forester

Kalispell Unit, Northwestern Land Office

Montana Department of Natural Resources and Conservation

March 2012

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CHECKLIST ENVIRONMENTAL ASSESSMENT

Project Name:	Pleasant Valley Timber Sale
Proposed Implementation Date:	June 2012
Proponent:	Department of Natural Resource and Conservation, Northwest Land Office, Kalispell Unit
Location:	Section 18, Township 28N, Range 26W Section 20, Township 28N, Range 26W Section 36, Township 28N, Range 27W
County:	Flathead County

I. TYPE AND PURPOSE OF ACTION

The Montana Department of Natural Resources and Conservation (DNRC) Kalispell Unit, is proposing a timber harvest on trust lands located in the Pleasant Valley area, N ½ Section 18 T28N R26W, S ½ Section 20 T28N R26W, S ½ SW ¼ Section 36, T28N, R27W, and E ½ NE ¼ Section 36, T28N, R27W (See Attachment 1, Area Maps, and Project Plan). The section is located approximately 35 miles west of Kalispell. The DNRC estimates that approximately 3.4MMBF from 554 acres would be harvested within this section. Silvicultural prescriptions would include commercial thin, seed tree and shelterwood harvest. Approximately 1500 feet of road would be built to access the sale area. The proposed action would produce estimated revenue of $195,000 for the State Normal Schools (SNS) Trust and $50,000 for the Common Schools (CS) Trust and an additional $120,000 in Forest Improvement fees.

Proposed Project Objectives Include:

- Increasing the vigor and health of the stand by limiting the effects of insects and disease as well as reducing the stocking level.
- Increasing forest productivity beneficial to future actions.
- Generating revenue for the Common School and State Normal School Trust Funds.

Lands involved in this proposed project area are held by the State of Montana in trust for the support for specific beneficiary institutions such as the Common Schools Trust Grant, and other state institutions (Enabling Act of February 22, 1889: 1972 Montana Constitution, Article 1 Section 11). The Board of Land Commissioners and the DNRC are required, by law, to administer these trust lands to produce the largest measure of reasonable and legitimate return over the long run for these beneficiary institutions (Section 77-1-202, MCA). DNRC would manage lands involved in this project in accordance with the State Forest Land Management Plan (SFLMP: DNRC 1996), the Administrative Rules for Forest Management (Rules: ARM 36.11.401 through 471) and the Montana DNRC Forested State Trust Lands Habitat Conservation Plan (HCP) as well as other applicable state and federal laws.

II. PROJECT DEVELOPMENT

1. PUBLIC INVOLVEMENT, AGENCIES, GROUPS OR INDIVIDUALS CONTACTED:

The legal advertisement and scoping letters were for multiple sales that are proposed in the area including this timber sale. A legal advertisement (public notice) was placed in the *Daily Inter Lake* on 9/4/11, 9/11/11, 9/18/11, and 9/25/11. There were also 35 letters sent out to all adjacent land owners

and interested parties. Seven comments were received concerning the proposed projects. Two comments were in support of the projects. One comment had concerns about big game winter range and new road construction. The other four comments were for sections not involved in this timber sale. Hydrological, soils, wildlife, and vegetative concerns were identified by DNRC specialists and field foresters for the effects of the Action and No Action Alternatives. Issues and concerns have been resolved or mitigated through project design or would be included as specific contractual requirements of the project. Recommendations to minimize the direct, indirect, and cumulative impacts have been incorporated in the project design.

2. OTHER GOVERNMENTAL AGENCIES WITH JURISDICTION, LIST OF PERMITS NEEDED:

U.S. Fish and Wildlife Service - In December 2011, the U.S. Fish and Wildlife Service (USFWS) issued DNRC an Incidental Take Permit under Section 10 of the Endangered Species Act. The Permit applies to select forest management activities affecting the habitat of grizzly bear, Canada lynx, and three fish species — bull trout, westslope cutthroat trout, and Columbia redband trout — on project area lands covered under the HCP. DNRC and the USFWS will coordinate monitoring of certain aspects of the conservation commitments to ensure program compliance with the HCP.

- Special Use Permit from U.S. Fish and Wildlife Service (For use of U.S.F.W.S. roads)
- Temporary Road Use Permit from Plum Creek Timber Company
- Temporary Road Use Permit from a private land owner
- Temporary Approach Permit from Flathead County Road Department

The DNRC is classified as a major open burner by the Montana Department of Environmental Quality (DEQ), and is issued a permit from the DEQ to conduct burning activities on State lands managed by the DNRC. As a major open burning permit holder, DNRC agrees to comply with all of the limitations and conditions of the permit.

The DNRC is a member of the Montana/Idaho Airshed Group which was formed to coordinate burning activities among members in order to minimize or prevent smoke impacts while using fire to accomplish land management objectives and/or fuel hazard reduction. As a member of the Airshed Group, DNRC agrees to burn only on days approved for good smoke dispersion as determined by the Smoke Management Unit in Missoula, MT.

3. ALTERNATIVE DEVELOPMENT:

No Action Alternative: Under this alternative, there would be no management activities taking place.

Action Alternative: Under the Action Alternative, the DNRC would harvest approximately 3.4 MMBF on 554 acres in the Pleasant Valley area. The timber would be harvested using conventional ground based skidding. The shade tolerant species and those infected or susceptible to insect and disease mortality would be removed to increase forest health and decrease the stocking level. There would be approximately 1500 feet of road built to access the section.

Issues surrounding this proposed action have either been resolved or mitigated through project design or would be included as specific restrictive requirements of this project. Recommendations to minimize direct, indirect and cumulative effects have been incorporated in the project design (Attachment I, Area Maps; Attachment II, Resource Analyses; Attachment III, Prescriptions; Attachment IV, Mitigations; Attachment V, Preparers and Consultants).

III. IMPACTS ON THE PHYSICAL ENVIRONMENT

- *RESOURCES potentially impacted are listed on the form, followed by common issues that would be considered.*
- *Explain POTENTIAL IMPACTS AND MITIGATIONS following each resource heading.*
- *Enter "NONE" If no impacts are identified or the resource is not present.*

4. GEOLOGY AND SOIL QUALITY, STABILITY AND MOISTURE:

Harvest activities would comply with Best Management Practices (BMP's). Mitigations include: limiting equipment operations to minimize soil compaction and rutting, planning appropriate skid trails, limiting skidding to slopes less than 40% and less than 20% of the harvest unit acreage, limiting disturbance and scarification, and retaining adequate amounts of large woody debris and fine litter following harvest. Thus, direct, indirect, and cumulative effects to the soil resource would be minimal.

Please refer to Attachment II, Soils Analysis for a more detailed analysis, and Attachment IV, Mitigations for a more detailed description of mitigations.

5. WATER QUALITY, QUANTITY AND DISTRIBUTION:

Harvest activities would use existing roads and segments of existing skid trails where feasible, would require DNRC approved drainage features on skid trails, and would comply with BMPs and all laws pertaining to Streamside Management Zones (SMZs).

Please refer to Attachment II, Water Resources Analysis for a more detailed analysis, and Attachment IV, Mitigations for a description of mitigations.

6. AIR QUALITY:

The project is located in Montana State Airshed 2 which encompasses all of Flathead and Lake Counties, most of Sanders County, and portions of Missoula and Powell Counties. This Airshed contains the Kalispell Impact Zone, an area that is smoke sensitive and has existing air quality problems. The proposed project area occurs outside of this impact zone. Under the Action Alternative, potential post-harvest burning of logging slash would produce some particulate matter. The DNRC would make all attempts to utilize logging slash to minimize the amount of burning needed. Burning within the project area would be short in duration and would be conducted when conditions favored good to excellent ventilation and smoke dispersion as determined by the Montana Department of Environmental Quality and the Montana/Idaho Airshed Group. DNRC would burn only on approved days. Harvesting and log hauling could create dust which may affect the air quality within the project area and along the haul route. Harvesting operations would be short in duration thereby minimizing dust dispersal within the local residential areas. Direct, indirect, and cumulative effects to air quality due to slash pile burning, harvesting, and hauling associated with the proposed action are expected to be minimal.

7. VEGETATION COVER, QUANTITY AND QUALITY:

Under the Action Alternative, timber harvest would occur on approximately 554 acres and would promote the development of the desired future condition of ponderosa pine and western larch/Douglas-fir. The overall forest health would improve due to the removal of unhealthy trees that are susceptible to insects and diseases that would increase the productivity of the stands. The decrease in tree mortality would cause a decrease in the amount of fuel loading for the site which would decrease the chance of a stand replacing fire. The occurrence of noxious weeds may increase due to logging disturbance.

Please refer to Attachment II, Vegetation Resources Analysis for a more detailed analysis, and Attachment IV, Mitigations for a description of mitigations

8. TERRESTRIAL, AVIAN AND AQUATIC LIFE AND HABITATS:

A DNRC wildlife biologist reviewed the project area, transportation system and harvest plan. There were eight wildlife resources that were identified and analyzed. Due to the ephemeral flows found in project area stream channels, a lack of surface connection of the streams to downstream waters, and data from Montana Fish, Wildlife and Parks showing no fish present near the project area, fish habitat will not be analyzed for this project.

Please refer to Attachment II: Resource Analysis, Wildlife Analysis for a more detailed analysis and Attachment IV, Mitigation for a description of specific mitigations.

9. UNIQUE, ENDANGERED, FRAGILE OR LIMITED ENVIRONMENTAL RESOURCES:

A DNRC wildlife biologist reviewed the project area, transportation system and harvest plan. Six threatened, endangered and sensitive species were identified.

Please refer to Attachment II: Resource Analysis, Wildlife Analysis for a more detailed analysis and Attachment IV, Mitigation for a description of specific mitigations.

10. HISTORICAL AND ARCHAEOLOGICAL SITES:

A scoping notice was sent to the DNRC archaeologist, there were no historical sites documented for the parcels proposed for harvest activities. If there are any sites or artifacts found, the area will be flagged off and no equipment will be allowed to operate in the immediate area.

11. AESTHETICS:

The project area can be seen from Lost Prairie Road, Pleasant Valley Road, and Lost Prairie Secondary Road. Harvest activities are expected to change the visual quality of the project area as seen from the roads. Harvest units would appear to be lighter in color due to the reduction in tree cover. Since many of the sections surrounding the project area have been harvested in the past, the proposed action is not expected to create any new or unique lines, shapes, or colors that do not already occur within the area. In fact, the impacts would be consistent with the surrounding landscape. Over time, both the existing roads and the open areas within the harvest area would become less visible due to natural regeneration. Direct, indirect, and cumulative aesthetic impacts associated with the proposed action are thus expected to be minimal and relatively short in duration.

12. DEMANDS ON ENVIRONMENTAL RESOURCES OF LAND, WATER, AIR OR ENERGY:

No direct, indirect, or cumulative impacts would be expected under either alternative.

13. OTHER ENVIRONMENTAL DOCUMENTS PERTINENT TO THE AREA:

Pleasant Valley Timber Sale (1980)

IV. IMPACTS ON THE HUMAN POPULATION

- *RESOURCES potentially impacted are listed on the form, followed by common issues that would be considered.*
- *Explain POTENTIAL IMPACTS AND MITIGATIONS following each resource heading.*
- *Enter "NONE" If no impacts are identified or the resource is not present.*

14. HUMAN HEALTH AND SAFETY:

Human health would not be impacted by the proposed timber sale or associated activity. There are no unusual safety considerations associated with the proposed timber sale.

15. INDUSTRIAL, COMMERCIAL AND AGRICULTURE ACTIVITIES AND PRODUCTION:

Timber harvest would provide continuing industrial production in the Flathead Valley.

16. QUANTITY AND DISTRIBUTION OF EMPLOYMENT:

People are currently employed in the wood products industry in the region. According to Montana Bureau of Business and Economic Research, approximately 10 jobs are supported for one year for every 1 MMBF that is harvested. For this project, that equates to approximately 11 jobs per year over three years.

17. LOCAL AND STATE TAX BASE AND TAX REVENUES:

People are currently paying taxes from the wood products industry in the region. Due to the relatively small size of the timber sale, there would be no measurable cumulative impact from this proposed action on tax revenues.

18. DEMAND FOR GOVERNMENT SERVICES:

Log trucks hauling to the purchasing mill would result in temporary increased in traffic on Pleasant Valley Rd., Lost Prairie Rd., Lost Prairie Secondary Rd and US Highway 2. This increase would be considered a normal contributor to the activities of the local community and industrial base.

19. LOCALLY ADOPTED ENVIRONMENTAL PLANS AND GOALS:

In 1996, the Land Board approved the ROD for the SFLMP. The SFLMP provides philosophical basis, consistent policy, technical rationale, and guidance for the management of forested state trust lands. In 2003, DNRC adopted the Forest Management Rules (ARM 36.11.401 through 456). The Forest Management Rules are the specific legal resource management standards and measures under which DNRC implements the SFLMP and subsequently its forest management program.

In December 2011, the Land Board approved the ROD for the Montana DNRC Forested State Trust Lands HCP. Approval of the ROD was followed by the issuance of an Incidental Take Permit (Permit) by the USFWS. The HCP is a required component of an application for a Permit which may be issued by the USFWS to state agencies or private citizens in situations where otherwise lawful activities might result in the incidental take of federally-listed species. The HCP is the plan under which DNRC intends to conduct forest management activities on select forested state trust lands while implementing specific mitigation requirements for managing the habitats of grizzly bear,

Canada lynx, and three fish species: bull trout, westslope cutthroat trout, and Columbia redband trout.

20. ACCESS TO AND QUALITY OF RECREATIONAL AND WILDERNESS ACTIVITIES:

The two sections adjacent to the Lost Trail Wildlife Refuge receive some use from horseback riders, hikers and hunters. Most of the use is concentrated along the South Pleasant Valley Road. During hunting season, timing restrictions for hauling and an alternative haul route will be used to accommodate the increased foot traffic on the South Pleasant Valley Road. Implementation of the proposed project will not displace any current uses of the area. Use is expected to remain the same or increase following this project.

21. DENSITY AND DISTRIBUTION OF POPULATION AND HOUSING:

There would be no measurable impacts related to population and housing due to the relatively small size of this project, and the fact that people are already employed in this occupation in the region.

22. SOCIAL STRUCTURES AND MORES:

No impacts related to social structures and mores would be expected under either alternative.

23. CULTURAL UNIQUENESS AND DIVERSITY:

No impacts related to cultural uniqueness and diversity would be expected under either alternative.

24. OTHER APPROPRIATE SOCIAL AND ECONOMIC CIRCUMSTANCES:

Costs, revenues and estimates of return are estimates intended for relative comparison of alternatives. They are not intended to be used as absolute estimates of return. The estimated stumpage is based on comparable sales analysis. This method compares recent sales to find market value for stumpage. These sales have similar species, quality, average diameter, product mix, terrain, date of sale, distance from mills, road building and logging systems, terms of sale, or anything that could affect a buyer's willingness to pay for timber. The effect of the proposed project will produce an estimated return of $195,000 for the State Normal Schools (SNS) Trust and $55,000 for the Common Schools (CS) Trust and an additional $125,000 in Forest Improvement fees. The no-action alternative would not produce revenue for the Common Schools (CS) Trust.

EA Checklist Prepared By:	**Name:**	Tyrell Colombo	**Date:**	March 6, 2012
	Title:	Management Forester		

V. FINDING

25. ALTERNATIVE SELECTED:

The Montana Department of Natural Resources and Conservation has completed the environmental assessment (EA) for the proposed Pleasant Valley Timber Sale as described on page three of this document.

The two alternatives proposed for consideration in this EA were the No-Action and Action Alternatives. The Action Alternative would provide for harvesting approximately 3.4MMBF on 554 acres in the Pleasant Valley area and include roughly 1500 feet of new road construction. The no-action alternative would not meet the objectives of the proposed project. After reviewing the EA, public comments, Department policies, standards, and guidelines, I have made the following decisions concerning this project:

I have selected the Action Alternative as described in this document for implementation with the understanding that the mitigations identified in Attachment IV of the Environmental Assessment will be implemented as described.

The Action Alternative has been selected for the following reasons:

- The Action Alternative meets the Purpose of Action and the specific project objectives listed on page 3 of the EA.
- The proposed project is consistent with state and local policies, laws, and regulations.
- The trust beneficiaries will be fairly compensated.

26. SIGNIFICANCE OF POTENTIAL IMPACTS:

Upon review of the project and the analysis herein, I find that none of the project impacts are regarded as severe, enduring, geographically widespread, or frequent. Further, I find that the quantity and quality of the natural resources, including any that may be considered unique or fragile, will not be adversely affected to a significant degree. I find no precedent for future actions that would cause significant impacts, and I find no conflict with local, State, or Federal laws, requirements, or formal plans. In summary, I find that adverse impacts will be avoided, controlled, or mitigated by the design of the project to an extent that they are not significant.

27. NEED FOR FURTHER ENVIRONMENTAL ANALYSIS:

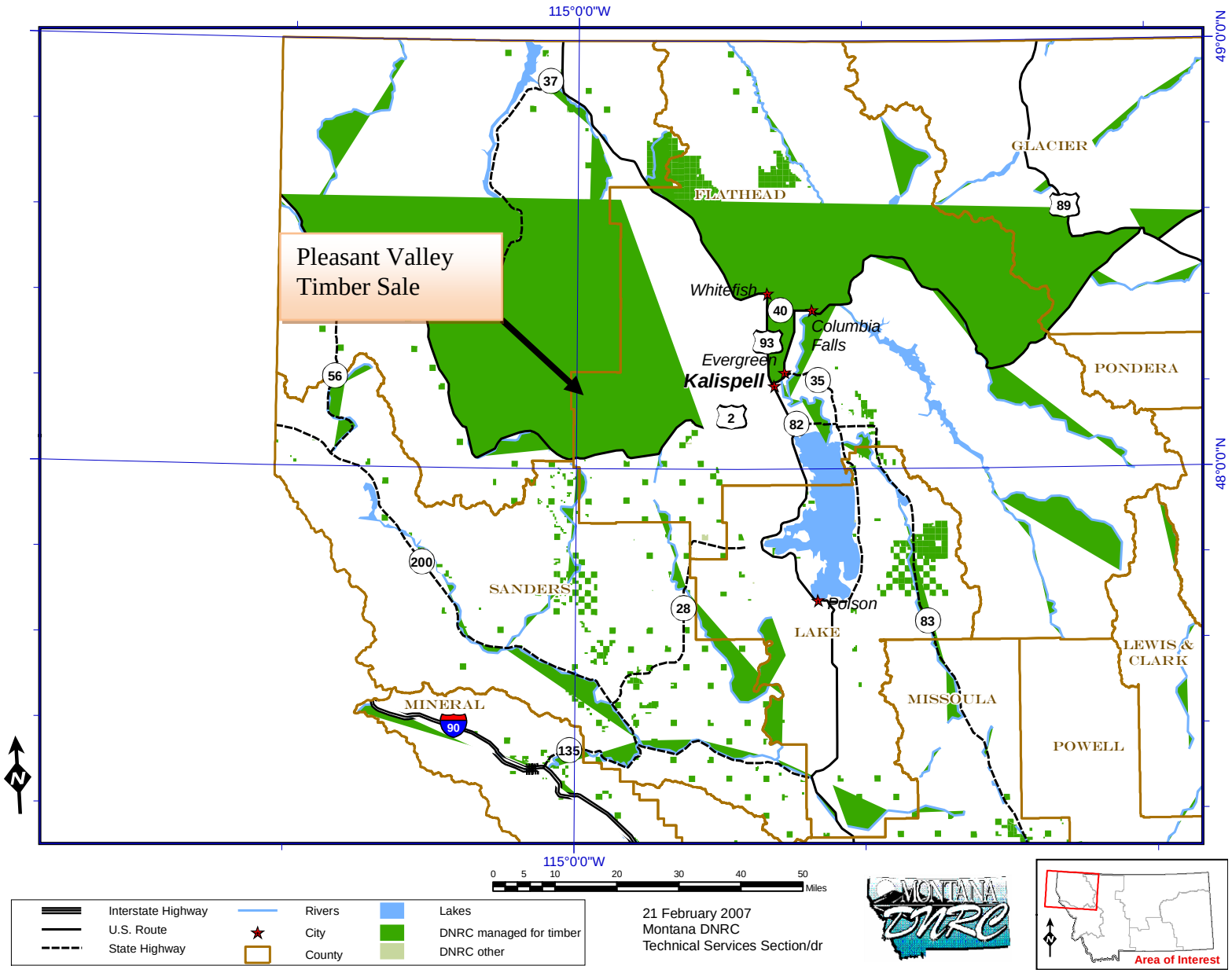
☐	EIS	☐	More Detailed EA	**X**	No Further Analysis

EA Checklist Approved By:	**Name: Greg Poncin** **Title: Kalispell Unit Manager**
Signature:	**Date**: 3/26/12

Attachment I

Project Area Maps

Page #


Pleasant Valley
Timber Sale
115°0'0"W
49°0'0"N
48°0'0"N
GLACIER
FLATHEAD
PONDERA
SANDERS
LAKE
LEWIS &
CLARK
MISSOULA
MINERAL
POWELL
Whitefish
Columbia
Falls
Evergreen
Kalispell
Polson
37
89
40
93
56
35
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82
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28
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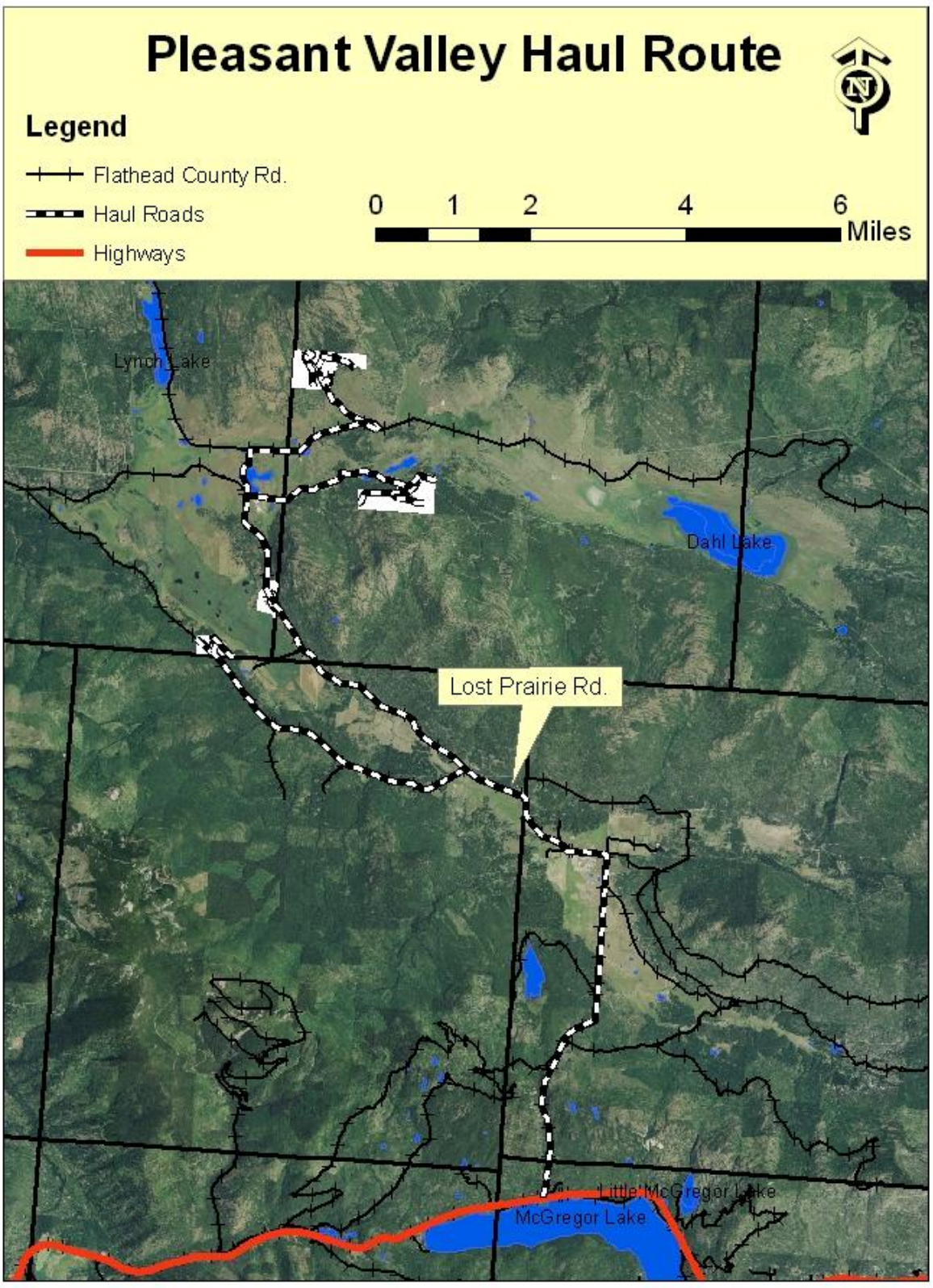
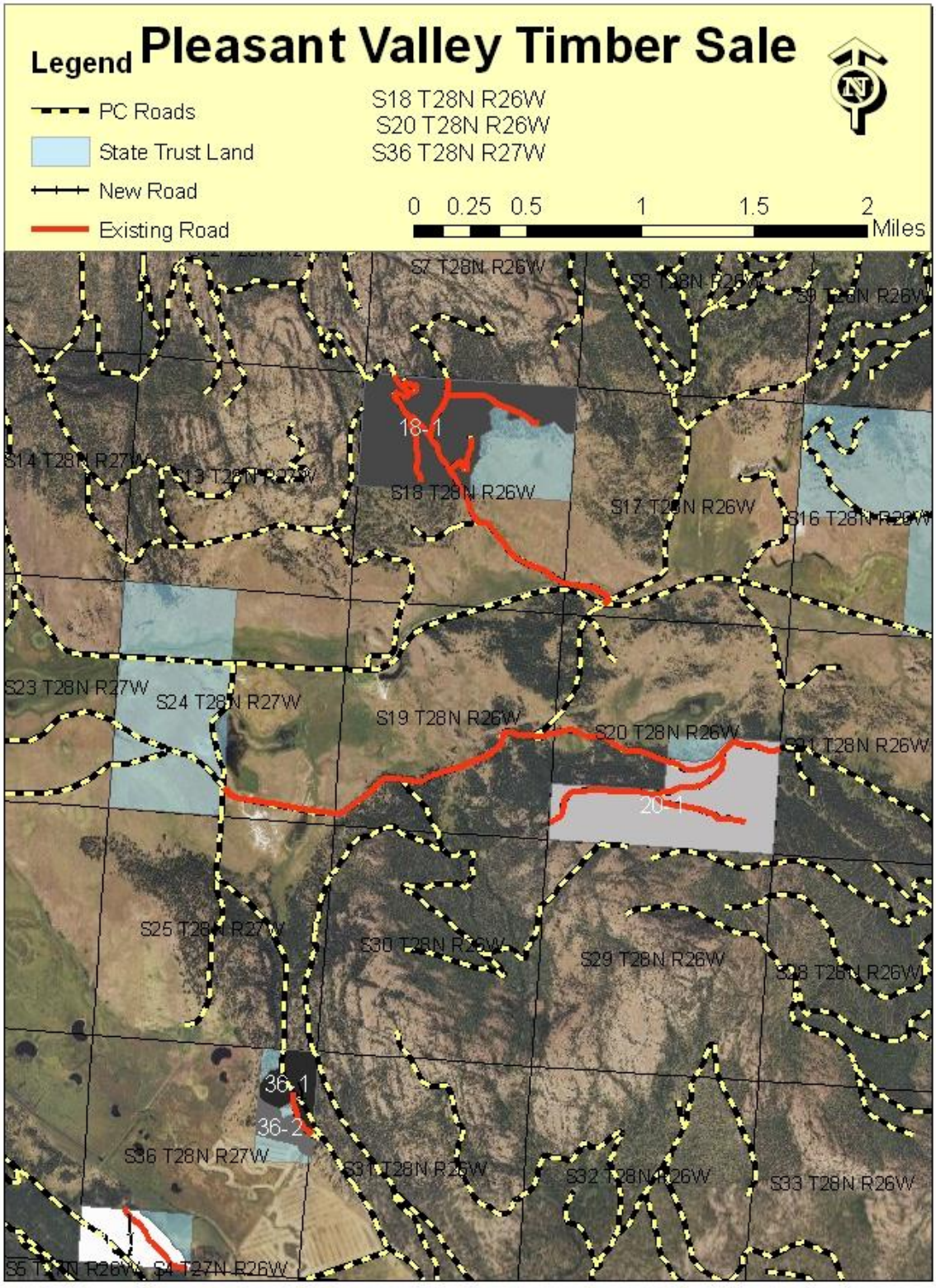
0 5 10 20 30 40 50
Miles
Interstate Highway
U.S. Route
State Highway
Rivers
City
County
Lakes
DNRC managed for timber
DNRC other
21 February 2007
Montana DNRC
Technical Services Section/dr
MONTANA
DNRC
Area of Interest

Pleasant Valley Haul Route




Legend
Pleasant Valley Timber Sale
PC Roads
State Trust Land
New Road
Existing Road
S18 T28N R26W
S20 T28N R26W
S36 T28N R27W
0 0.25 0.5 1 1.5 2
Miles
18-1
20-1
36-1
36-2
S7 T28N R26W
S14 T28N R27W
S18 T28N R26W
S17 T28N R26W
S16 T28N R26W
S23 T28N R27W
S24 T28N R27W
S19 T28N R26W
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S25 T28N R27W
S30 T28N R26W
S29 T28N R26W
S36 T28N R27W
S31 T28N R26W
S32 T28N R26W
S33 T28N R26W

Attachment II

Resource Analysis

Page #

VEGETATION ANALYSIS

INTRODUCTION

This analysis is used to look at the existing conditions of the vegetation in the proposed area and determine the possible effects that could result from the alternatives of the project. During the initial scoping, issues were developed by the public and internally regarding vegetative concerns. The following concerns were expressed from these comments regarding proposed timber harvesting and related activities:

- Forest Health: There are concerns that endemic populations of diseases and insects are increasing on the site and have the potential to reach epidemic proportions or reduce productivity.

- Fire Ecology: There is a concern that the exclusion of fire from the landscape has changed the historical stand compositions from the desired conditions. This change is prevalent in the Pleasant Valley area.

- Forest Productivity: There are concerns with the canopy closure and the increased competition between trees which will decrease the productivity of the trees. The increase in competition will also stress the trees which will increase the trees susceptibility for disease and insect outbreaks.

GENERAL DESCRIPTION OF THE AREA

The proposed Pleasant Valley Timber Sale is located approximately 35 miles west of Kalispell, MT and 10 miles north of McGregor Lake. It is located in N ½ Section 18 T28N R26W, S ½ Section 20 T28N R26W, S ½ SW ¼ Section 36, T28N, R27W, and E ½ NE ¼ Section 36, T28N, R27W (See Attachment 1, Area Maps). The three sections have 702 acres of State Trust Land. Section 18 and 20 are bordered by the Lost Trail Wildlife Refuge as well as Plum Creek Timber land. The Plum Creek land has been heavily managed in past years. The Lost Trail Refuge land consists of mostly grass land with some young stands of timber. The two parcels in section 36 are bordered by private property and Plum Creek Timber Land.

ANALYSIS METHOD AND AREAS

The Kalispell Unit typically prepares two to four timber sales per year. Each project is evaluated for its potential effects on lands managed by the DNRC and the surrounding landscape. Methods used in the analysis included review of stand level inventory (SLI) data, field visits, review of scientific literature, aerial photography, and consultation with other professionals. The area used to determine the direct and indirect impacts to vegetation are N ½ Section 18 T28N R26W, S ½ Section 20 T28N R26W, S ½ SW ¼ Section 36, T28N, R27W, and E ½ NE ¼ Section 36, T28N, R27W. The area used to determine cumulative impacts is the Kalispell Unit.

EXISTING CONDITIONS

Stand History and Past Management Activities

The four parcels of State Trust land that are included in the timber sale have been previously managed. The first entry occurred from 1950-1952. The old growth western larch, Douglas-fir, and ponderosa pine were harvested using a seed tree prescription. Approximately 3 miles of road was built to access for this timber sale the four parcels of land. The total volume removed was roughly 9 MMBF. The second entry occurred between 1980 and 1982. The remaining seed trees from the first entry were removed. The second growth Douglas-fir, western larch and ponderosa pine were commercially thinned. There was approximately 1 mile of new road was constructed for this timber harvest. The total volume removed was about 1.5 MMBF.

Forest Habitat Types

The Pleasant Valley project area has Douglas-fir (*Pseudotsuga menziesii),* spruce (Picea), and subalpine fir (Abies lasiocarpa) forest habitat types. The majority of the area is classified in the Douglas-fir type. This indicates that most of the project is classified as a moderately warm/dry site with some areas of cooler/moist sites located on north facing slopes. The timber production ranges from moderate to high. Ponderosa pine, Douglas-fir, and western larch are the dominant species with scattered Engelmann spruce, subalpine fir, grand fir, and lodgepole pine.

Fire Regimes

A mosaic of even and multi-aged patches is present in the project area. The majority of the Pleasant Valley project area would be classified in a low to moderate/ mixed severity fire regime. Fire intervals are considered to be frequent, 50 years or less. Most of the project area has evidence of past fire activity on old growth snags that are present. Forest stands shaped by frequent to mixed severity fires typically have an abundance of seral species in the overstory.

As a result of fire suppression, stands of the PP (ponderosa pine) and WL/DF (western larch/Douglas-fir) cover types that characteristically would have been open-grown now have thick understories of more shade tolerant species throughout both the project area and Kalispell Landscape. In general, fire return intervals have been lengthened and fire intensity has increased due to increased fuel loadings vertically and horizontally. Lower intensity, more frequent fires would have kept a larger composition of seral species and provided for less shade tolerant regeneration.

Insect and Disease Activity

Inventory and field reconnaissance were used to identify and quantify insect and disease activity in the project area.

1. Western Spruce Budworm (*Choristoneura occidentalis*)
    - Spruce budworm is the largest problem in the stands. A large portion of the regeneration has been defoliated as well as some of the overstory trees.

2. Dwarf Mistletoe (*Arceuthobium laricis*)

- Western larch dwarf mistletoe has a minor presence affecting the overstory.

3. Bark Beetles
   - There is evidence of Douglas-fir beetle (*Dendroctonus pseudotsugae*) in the area. The infestation is minimal but a few pockets of dead Douglas-fir have been observed. There have also been ponderosa pine and lodgepole pine with evidence of mountain pine beetle (*Dendroctonus ponderosae)*.

Forest Age Class & Cover Type Distributions

Table 2–1. Current and appropriate cover types for the Kalispell Unit.

Cover Type	Current Cover Type (Acres	Appropriate Cover Type (Acres)	Current Type Minus (-) Appropriate Type (Acres)
SAF	2249.9	254.8	1995.1
DF	1646.5	1029.4	617.1
HW	449	207	242
LP	2269.2	1376.8	892.4
MC	10265.8	2282.3	7983.3
PP	10636.9	11936.2	-1299.3
OTHER	3635.4	3576.2	59.2
WL/DF	25494.6	32974.5	-7479.9
WWP	567.6	3577.7	-3010.1
TOTAL	57214.9	57214.9	--

SAF = subalpine fir. DF = Douglas-fir. LP = lodgepole pine. MC = mixed conifer. PP = ponderosa pine. WL/DF = western larch/ Douglas-fir. WWP = western white pine. Other = non stocked lands, nonforest, or water. The Current Type minus Appropriate Type column above lists the excess and deficit (-) acres for each Cover Type.

Table 2-1 shows the difference between the current cover types and the desired future conditions for all of the acres of state trust land under the Kalispell DNRC management. The abundance of shade tolerant cover types and the lack of seral cover types can be attributed to two things. The first is the removal of old growth western larch, Douglas-fir, ponderosa pine, and western white pine about 60 years ago. The second factor is the exclusion of fire which allows the more shade tolerant species to become established in the stands with low severity high frequency fire regimes.

Table 2–2. Current and appropriate cover types & stand compositions for the Pleasant Valley Timber Sale project area.

Cover Type	Current Cover Type (Acres)	Appropriate Cover Type (Acres)	Current Type Minus (-) Appropriate Type (Acres)
SAF	88	0	88
DF	0	0	0
HW	0	0	0
LP	14	0	14
MC	7	0	7
PP	296	350	-54
Other	111	111	0
WL/DF	186	241	-55
WWP	0	0	0
TOTAL	702	702	--

SAF = subalpine fir. DF = Douglas-fir. LP = lodgepole pine. MC = mixed conifer. PP = ponderosa pine. WL/DF = western larch/ Douglas-fir. WWP = western white pine. Other = non stocked lands or nonforest. The Current Type minus Appropriate Type column above lists the excess and deficit (-) acres for each Cover Type.

Table 2-2 shows the current and potential cover types for the Pleasant Valley project area. It reflects the same trend in forest cover type shifts as the Kalispell landscape, but not as drastically due to previous harvest activities. The previous management activities removed most of the shade tolerant species and left the seral species.

Old Growth Stands

As per the Land Board's decision in February, 2001, the DNRC adopted definitions for old growth by forest habitat groups, based on minimum number and size of large trees per acre and age of those trees as noted in *Old-Growth Forest Types of the Northern Region(Green et. Al. 1992).* The DNRC approach to old-growth management (and forest management in general) is further clarified in (ARM 36.11.401 to 36.11.450). Field verification of older stands modeled in the coarse filter analysis of SLI data for the project area identified no stands within the project area meeting the DNRC's old growth definition.

Sensitive Plants

A review of the records from the MNHP for the project indicated two plant species of special concern identified within the project area.

1. Hutchinsia (*Hornungia procumbens*)
    - Hutchinsia is an annual mustard that grows in vernally moist, alkaline soil of sagebrush steppe in the valley to lower montane zones. There have been six observed in Montana and one of the occurrences was in the Pleasant Valley. Threats to the species' viability in Montana appear to minimal.

2. Spalding's Catchfly (*Silene spaldingii*)
    - Spalding's catchfly is a perennial plant that grows in open, mesic grasslands in the valleys and foothills usually with rough fescue, Nelson's needlegrass, Richardson's needlegrass and Idaho fescue. Occasionally with scattered ponderosa pine or broadleaf shrubs. Soils are usually deep and loamy. *S. spaldingii* typically occurs on northerly aspects and along draws and swales. There is a population of plants located on the Lost Trail National Wildlife Refuge. The two major threats to the species viability in Montana are invasive weeds that are negatively impacting the bunchgrass habitat and cattle grazing.

Noxious Weeds

Spotted knapweed (*Centautea stoebe*) is the most abundant noxious weed within the project area. It is mainly established along existing roads with some spreading to adjacent grassy openings. Houndstongue (*Cyroglossum oficinale*) and St. Johnswort (*Hypericum perforatum*) are also present within the project area. Both are present in grassy opening which could be attributed to previous grazing activity that occurred. Native plant species may not re-colonize these areas. Several factors increase the likelihood of continued weed encroachment in the project area. Three factors are the proposed timber harvest and associated log hauling, grazing leases on state trust land, and heavy usage of the area for recreation and hunting.

ENVIRONMENTAL EFFECTS

Direct and Indirect

No Action Alternative

No timber harvest or associated activities would occur under this alternative. Timber types would continue to advance towards climax conditions and away from desired future conditions. Growth and vigor of the trees present in the analysis area would continue to decline as competition for resources increases. Noxious weeds would continue to exist along the roads and move into the forested areas as natural disturbances prepare appropriate seedbeds.

Action Alternative

The proposed alternative would harvest timber on approximately 554 acres and promote the desired future conditions of western larch/Douglas-fir and ponderosa pine. Harvest activities would maintain the desired cover types of ponderosa pine on 261 acres and western larch/Douglas-fir on 170 acres. Harvest activities would also move 98 acres of mixed conifer and subalpine cover types to the desired cover type of western larch/Douglas-fir. The harvest would be focused on the removal of those trees affected by or susceptible to insect and disease mortality, as well as shade tolerant tree species. More detailed information for treatment can be obtained in Attachment III, "Prescriptions". Through harvest and site preparation activities, fuel loadings would be reduced by the removal of ladder fuels from the understory and intermediate components of these stands. Crown spacing in the intermediate and overstory components of treated stands would increase, resulting in decreased fuel continuity.. Growth and vigor of residual trees would

increase as a result of increased residual tree spacing that would allow full light to crowns and more access to water.

Noxious weeds may increase due to the disturbance and the opening in the canopy. However, this will be monitored and addressed through an integrated pest management plan including chemical and biological control methods. The spread of weeds would be controlled by washing of equipment before it is moved on site and with weed treatments along roads.

The area will be monitored for the two sensitive plant species (Hutchinsia and Spalding's Catchfly). If one of the species is found, an equipment restriction zone will be made around the plant and a plant survey will be conducted in the area.

Cumulative Effects

No Action Alternative

Under this alternative, stand structure and species composition on State land across the Kalispell Unit are expected to continue the change towards more shade tolerant species. Fuel loading is also expected to increase due to tree mortality and ladder fuels.

Action Alternative

The timber harvesting treatments occurring under the Action Alternative would, in combination with other State timber harvesting activities, alter the current cover type distribution by promoting the development of desired future cover types on the Kalispell Unit. Specifically, these projects would reduce the acreage of mixed conifer, subalpine fir, lodgepole pine, and Douglas-fir types and increase the western larch/Douglas-fir, ponderosa pine, and western white pine cover types. Untreated stands would be expected over time to develop an increasing component of shade-tolerant species that would in most cases lead stands away from DNRC's desired future conditions.

The timber harvest treatments would also increase the stand productivity by decreasing the stocking levels of the stands. By decreasing the stocking levels, this would cause the trees to get adequate space to become healthier and more resistant to insects and diseases. The amount of tree mortality will decrease which would decrease the fuel loading. The site disturbance from the timber harvest would potentially cause the spread of noxious weeds. The spread of weeds would be controlled by washing of equipment before it is moved on site and with weed treatments along roads.

The proposed action would occur on about 554 acres of the Kalispell Unit total 57,215 acres or approximately 1% of the total Kalispell Unit acreage. These changes would result in minor and inconsequential impacts across the landscape of the Kalispell Unit.

Vegetation References

- Forestry Best Management Practices.

- DNRC, 1996. State Forest Management Plan. Montana DNRC, Forest management Bureau. Missoula, MT.

- Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. Old-growth forest types of the Northern Region. USDA Forest Service, Northern region. Missoula, Montana.

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WILDLIFE ANALYSIS

INTRODUCTION

The wildlife analysis is designed to disclose the existing condition of wildlife resources and the anticipated direct, indirect, and cumulative effects that may result from implementing the No-Action and Action alternatives presented Chapter 2. The following issue statements were developed from concerns raised by DNRC specialists and public comments received during scoping and will be addressed in the following analysis:

- **Mature forest cover and connectivity.** The proposed activities could decrease mature forested cover, which could reduce habitat connectivity and suitability for wildlife species associated with mature forest.
- **Snags and coarse woody debris.** The proposed activities could reduce the availability of snags and coarse woody debris and increase human access for firewood harvesting, which could adversely affect the quality of wildlife habitat.
- **Canada lynx.** The proposed activities could reduce landscape connectivity and the availability of suitable Canada lynx habitat types (i.e. summer forage, winter forage, other suitable, temporary non-suitable), reducing the ability of the area to support Canada lynx.
- **Grizzly bears.** The proposed activities could alter the availability of grizzly bear visual screening cover and could increase human access, which could displace bears and increase the risk of human-caused bear mortality.
- **Fishers.** The proposed activities could reduce the availability and connectivity of preferred fisher habitats and increase human access, which could reduce habitat suitability and increase trapping mortality.
- **Flammulated owls.** The proposed activities could alter the structure of flammulated owl preferred habitat types, which could reduce habitat suitability for flammulated owls.
- **Pileated woodpeckers.** The proposed activities could reduce tree density and alter the structure of mature forest stands, which could reduce habitat suitability for pileated woodpeckers.
- **Gray wolves.** The proposed activities could disturb gray wolves and reduce big game winter range habitat quality, which could displace gray wolves from denning and rendezvous sites and reduce prey availability.
- **Big game winter range.** The proposed activities could reduce cover, which could reduce the quality of big game winter range habitat.

ANALYSIS AREAS

Analysis areas are delineated at multiple scales appropriate for analyses of: 1) direct and indirect effects, and 2) cumulative effects. These scales are described in more detail below.

Direct and Indirect Effects Analysis Area

The direct and indirect effects of the proposed activities were analyzed on lands within the project area (FIGURE W-1 –ANALYSIS AREAS). The project area consists of 702 acres of DNRC-managed lands in Sections 18 and 20 T28N, R26W and Section 36 T28N, R27W.

Cumulative Effects Analysis Areas

The cumulative effects analysis area refers to a broad surrounding landscape scale and varies according to the issue or wildlife species being discussed. Cumulative effects analysis areas are summarized in TABLE W-1 –ANALYSIS AREAS (FIGURE W-1 – ANALYSIS AREAS). Cumulative effects analysis areas include the project area as well as lands managed by other agencies and private landowners. Detailed descriptions of each analysis area are located in the **Existing Condition** section for each issue or species being discussed (e.g., snags and coarse woody debris, grizzly bears).

TABLE W-1. ANALYSIS AREAS. Descriptions of the direct and indirect effects analysis area and cumulative effects analysis areas.

ANALYSIS AREA	DESCRIPTION	TOTAL ACRES	ISSUE(S)/SPECIES ANALYZED
Direct & Indirect Effects	Project Area	702	direct & indirect effects for all issues/species
Medium Cumulative Effects	Portions of the Pleasant Valley Creek and Pleasant Valley Fisher River-Pearsons Reservoir Subwatersheds. Boundaries were defined according to subwatersheds and geographic features (e.g. ridgelines).	23,451	fishers, flammulated owls
Large Cumulative Effects	Portions of the Island Creek, Pleasant Valley Creek, and Pleasant Valley Fisher River-Pearsons Reservoir Subwatersheds. Boundaries defined according to subwatersheds and geographic features (e.g. ridgelines).	46,607	snags and coarse woody debris, mature forested habitats and connectivity, grizzly bears, Canada lynx, gray wolves, big game winter range

ANALYSIS METHODS

Analysis methods are based on DNRC *State Forest Land Management Rules* designed to promote biodiversity. Biodiversity is promoted by taking a coarse-filter approach as well as a fine-filter approach. The coarse-filter approach favors an appropriate mix of stand structures and compositions on state lands (*ARM 36.11.404*) and assumes that if landscape patterns and processes are maintained, then a full complement of species would persist and biodiversity would be maintained. Because the coarse-filter approach may not adequately address the full range of biodiversity on DNRC lands, DNRC also employs a complementary fine-filter approach which addresses the habitat requirements of threatened, endangered, and sensitive species (*ARM 36.11.406*).

The coarse-filter wildlife analysis section includes analyses of direct, indirect and cumulative effects of the proposed alternatives on: 1) mature forested habitats and landscape connectivity, and 2) snags and coarse woody debris. Effects to old growth (*Green et al. 1992*) were dismissed from analysis because the project area does not contain old growth. Specialized analysis methods are discussed in each section.

The fine-filter wildlife analysis section includes analyses of the direct, indirect and cumulative effects of the proposed alternatives on: 1) species listed as threatened or endangered under the Endangered Species Act of 1973, 2) species listed as sensitive by DNRC, and 3) species managed as big game by DFWP. Specialized analysis methods are discussed in the sections pertaining to each species.

Existing conditions are described for each relevant species or issue and were assessed with the following techniques: field visits, scientific literature consultation, Montana Natural Heritage Program (MNHP) data queries, DNRC Stand Level Inventory (SLI) data analysis, aerial photograph analysis, and consultation with professionals. Cumulative effects analyses account for all known past and current activities, as well as planned future agency actions. DNRC is currently unaware of any additional ongoing or proposed actions that could contribute to cumulative effects in the vicinity of the project area.

CORSE-FILTER WILDLIFE ANALYSIS

The coarse-filter wildlife analysis discloses the existing conditions and the anticipated direct, indirect and cumulative effects of the proposed alternatives on: 1) mature forested habitats and landscape connectivity, and 2) snags and coarse woody debris.

MATURE FORESTED HABITATS AND CONNECTIVITY

> ***Issue:*** *The proposed activities could decrease mature forested cover, which could reduce habitat connectivity and habitat suitability for wildlife species associated with mature forest.*

Introduction

Mature forests characterized by abundant, large diameter trees and dense canopy cover provide many wildlife species with food, shelter, breeding sites, and travel corridors. Historically, the spatial configuration of mature forested habitats in the western United States was shaped by natural disturbance events, primarily wildfire, blowdown, and pest outbreaks. Natural disturbance events resulted in a mosaic-like spatial configuration of forest patches varying in age, species composition and development. Spatial configuration, including patch size and connectivity of forested habitats, is important for many wildlife species. Patch size may affect the distribution of wildlife species that are attracted to, or avoid forest edges. Additionally, connectivity of mature forested habitats may facilitate movements of species that avoid openings in canopy cover, or inhibit movements of species that are attracted to openings in canopy cover. For example, discontinuous mature forested habits would negatively affect movements of fisher, which avoid large openings in canopy cover.

Timber harvest, like wildfire and blowdown, is a disturbance event that often creates open patches of young, early-successional habitats. Consequently, timber harvest may

negatively affect wildlife species dependent on mature forests by reducing the amount and connectivity of these habitats. Conversely, wildlife species adapted to early-successional habitats may benefit from timber harvests and similar natural disturbance events. The following analysis discloses existing conditions and the anticipated direct, indirect, and cumulative effects of the proposed activities on mature forested habitats and connectivity.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the large cumulative effects area described in TABLE W-1 –ANALYSIS AREAS (FIGURE W-1 –ANALYSIS AREAS). The large cumulative effects analysis area represents an area large enough to support a diversity of species that use mature forested habitats and/or require connected forested habitats.

Analysis Methods

Analysis methods for mature forested habitats and landscape connectivity include field evaluations and Geographical Information System (GIS) analysis of aerial-photographs and USFS canopy cover data (VMap 9.1.1). Mature forested habitat is defined here and in the remainder of the document as forest stands with ≥40% canopy cover comprised primarily of trees that are on average >9 inches dbh. Forested stands containing trees of at least this size and density were considered adequate for providing minimal conditions necessary to facilitate movements of many wildlife species that benefit from well-connected mature forest conditions across the landscape. Factors considered in the analysis include: 1) the degree of timber harvesting, 2) availability of mature forested habitats (≥40% canopy cover, >9 inches dbh average), 3) average patch size, 4) open and restricted road density, and 5) the availability of potential travel corridors.

EXISTING CONDITIONS

Mature Forested Habitats and Connectivity

The project area currently contains approximately 355 acres of mature stands of ponderosa pine, western larch, Douglas-fir, subalpine fir, and mixed conifers (50.6% of project area) (TABLE W-2 –MATURE FOREST). Average patch size is relatively small (average: 51 acres, range: 3-151 acres), however, the majority of mature forested habitat is continuous (FIGURE W-1 –ANALYSIS AREAS). Mature canopy cover ranges from low (40%) to high (75%) throughout the project area. Areas with higher canopy cover likely facilitate use by species requiring connected mature habitats, although limited mature canopy cover is available in the vicinity of the project area. The project area does not occur in any particular area of documented importance for habitat connectivity; however, riparian habitat associated with class 2 and 3 streams (*ARM 36.11.403(16)(17)*) in the project area likely facilitates wildlife movements and may connect the project area to small patches of mature forested habit in the vicinity of the project area. Open and restricted roads reduce the connectivity of the project area. Open road density in the project area is moderate at 1.3 miles/square mile. The density of all roads in the project area is high at 4.9 miles/square mile.

The large cumulative effects analysis area is relatively open and contains few mature stands with ≥40% canopy cover (>9 inches dbh average) (TABLE W-2 –MATURE FOREST). The large cumulative effects analysis area contains low elevation valleys with timber stands on the surrounding hillsides. The low elevation habitat associated with the Pleasant Valley Creek and the Pleasant Valley Fisher River consists primarily of grass and riparian shrubs. Additionally, the higher elevation habitat in the large cumulative effects analysis area is primarily privately owned (Plum Creek, Stoltze Lumber; 61.5% analysis area) and consequently, many timber stands in the large cumulative effects analysis area are young stands or contain <40% canopy cover due to recent harvesting during the last several decades. Mature forested habitat exists in small, scattered patches (average: 38 acres, range: 3-260 acres) and in the vicinity of the project area, mature forested patches are generally small and disconnected (FIGURE W-1 –ANALYSIS AREAS). Across the analysis area, the Peasant Valley Creek, Pleasant Valley Fisher River, and additional smaller streams provide wildlife travel corridors. However, these areas likely receive limited use by wildlife species requiring mature forested habitat due to the low availability of this habitat type in the large cumulative effects analysis area. Additionally, moderate open and restricted road densities in the large cumulative effects analysis area further reduce connectivity of the area (2.1 miles/square mile open road density and 3.2 miles/square mile density of all roads).

TABLE W-2 -MATURE FOREST. Mature forested habitat (≥40% canopy cover, >9 inches dbh) existing condition and expected post-harvest condition (acres). Percent of the total analysis area is in parentheses.

ANALYSIS AREA	EXISTING AVERAGE PATCH SIZE	EXISTING MATURE FOREST	POST-HARVEST MATURE FOREST
Direct & indirect effects (% of area)	50	355 (50.6%)	2 (0.3%)
Large cumulative effects (% of area)	38	3,635 (7.8%)	3,282 (7.0%)

ENVIRONMENTAL EFFECTS

Direct and Indirect Effects of the No-Action Alternative on Mature Forested Habitats and Connectivity

None of the proposed forest management activities would occur. Forests would continue to age, and dense stands of shade-tolerant trees would continue to develop. Patch size and the availability of mature forested habitat may increase over time, slightly increasing connectivity. Thus, since: 1) no appreciable change in the availability of mature forested habitat would occur, 2) no changes in open or restricted road density would occur, and 3) no changes in the availability of travel corridors would occur, no direct or indirect effects to mature forested habitat availability and connectivity would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Mature Forested Habitats and Connectivity

Mature forested habitat is located throughout the project area and ranges from low to high canopy cover (40-75%). The shelterwood and seed tree cuts proposed for 353 acres of mature forested habitat in the project area would open the timber stands in most areas to <40% canopy cover. This change in forest stand density would occur on virtually all of the existing mature forest in the 702-acre project area. Approximately 0.3 mile of roads would be constructed, but access to these roads would be closed following the proposed activities. Open road density would not change and total road density would increase from 4.9 miles/square mile to 5.1 miles/square mile on the project area. Some harvesting is proposed within the riparian habitat associated with the Class 2 and Class 3 streams in the project area, but vegetation retention measures would apply (*DNRC HCP FEIS Vol. II, pp. 2-62 to 2-84*). Thus, since: 1) the availability of mature forested habitat would decrease by 353 acres (i.e., 50.3% of the lands in the project area), 2) restricted road density would increase by a minimal amount, but open road density would not change, 3) some harvest would occur in riparian habitats, but retention measures would apply, and 4) given existing landscape conditions and lack of appreciable mature forest on lands adjacent to the project area, moderate direct or indirect effects to mature forested habitat availability and connectivity would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Mature Forested Habitats and Connectivity

None of the proposed forest management activities would occur. Forests in the project area would continue to age, and dense stands of shade-tolerant trees would continue to develop. Connectivity would not be affected under this alternative. Any proposed or ongoing activities on other ownerships may affect the availability and connectivity of mature forested habitats in the large cumulative effects analysis area. Thus, since: 1) no appreciable change in the availability of mature forested habitat would occur, 2) no changes in open or restricted road density would occur, and 3) no changes in the availability of travel corridors would occur, no cumulative effects to mature forested habitat availability and connectivity would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Mature Forested Habitats and Connectivity

The proposed activities would affect 353 acres of the 3,635 acres (9.7%) of mature forested habitat available in the large cumulative effects analysis area. The proposed activities would open the timber stands in most areas to <40% canopy cover and reductions in canopy cover and stand density reduction would be additive to harvest activities that are proposed or ongoing in the large cumulative effects analysis area, although DNRC is unaware of any specific activities at this time. Overall, the availability of mature forested habitat in the large cumulative effects analysis area is low (7.8% of analysis area), and the area is not likely to support populations of wide-ranging wildlife species dependent upon connected mature forest. Total road density in the large cumulative effects analysis area would increase slightly following construction of 0.3 miles of restricted roads on DNRC lands, but open road density would not change. Some harvesting is proposed within the riparian habitat associated with the Class 2 and Class 3 streams in the project area, but vegetation retention measures would apply (*DNRC HCP FEIS Vol. II, pp. 2-62 to 2-84*). Thus, since: 1) the availability of mature forested habitat would decrease by 9.7%, 2)

restricted road density would increase, but open road density would not change, and 3) some harvest would occur in riparian habitats, but retention measures would apply, and 4) given existing poor habitat conditions and lack of connected suitable mature forest habitat on lands in the large cumulative effects analysis area, minor adverse cumulative effects to mature forested habitat availability and connectivity would be anticipated as a result of the Action Alternative.

SNAGS AND COARSE WOODY DEBRIS

> ***Issue**: The proposed activities could reduce the availability of snags and coarse woody debris and increase human access for firewood harvesting, which could adversely affect the quality of wildlife habitat.*

Introduction

Snags and coarse woody debris are important components of forest ecosystems that provide the following functions: 1) increase structural diversity, 2) alter the canopy microenvironment, 3) promote biological diversity, 4) provide important habitat substrates for wildlife, and 5) act as storehouses for nutrient and organic matter recycling agents (*Parks and Shaw 1996*). Snags and defective trees (i.e. partially dead, spike top, broken top) are used by a wide variety of wildlife species for nesting, roosting, and cover. Primary cavity users (i.e. woodpeckers) excavate nesting and roosting cavities in snags. These cavities are used as nesting, roosting, and resting sites by a variety of secondary cavity users, such as small mammals and birds, which are unable to excavate their own cavities. Snags also provide foraging opportunities for insectivorous wildlife species. Snag-habitat value for wildlife varies according to tree species, diameter, and snag density. Thick-barked species (e.g. western larch and ponderosa pine) tend to provide high quality snag habitat. Snag diameter is important because many species that nest in smaller diameter snags will also use large snags; however, the opposite is not true.

Coarse woody debris is used by a variety of wildlife species for foraging, shelter, lookout sites, and food storage. Additionally, coarse woody debris provides forest-dwelling amphibians and reptiles with a stable environment (i.e. moisture and temperature). Coarse woody debris habitat value varies according to size, length, decay, and distribution of coarse woody debris. Single, scattered downed trees may provide access under the snow for small mammals and weasels, while log piles may provide secure areas for snowshoe hares. Timber harvest may affect the abundance and spatial distribution of snags and coarse woody debris by direct removal or by increasing human access for firewood harvesting.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the large cumulative effects analysis area described in TABLE W-1 –ANALYSIS AREAS (FIGURE W-1 – ANALYSIS AREAS). The large cumulative effects analysis area represents an area large enough to support a diversity of species that use coarse woody debris and snags.

Analysis Methods

Analysis methods for snag and coarse woody debris include field assessments at 6 study plots according to protocols modified from the *State Forest Land Management*

Implementation Guidance (*Montana DNRC 2000*). Factors considered in the analysis include: 1) the level of harvesting, 2) availability of snags and coarse woody debris, and 3) risk of firewood harvesting.

EXISTING CONDITIONS

Snags and Coarse Woody Debris

Low snag density and limited coarse woody debris was observed during field assessments. Coarse woody debris was 6.4 tons/acre (range: 0-19.5 tons/acre). Only one ponderosa pine snag was recorded during field assessments (8 inch dbh), and few snags were observed overall during visits to the project area (1.1 snags/acre). Legal and illegal motorized human access has likely reduced the availability of coarse woody debris and snags in the project area and firewood cutting risk is currently moderate due to accessibility of the project area (1.3 miles/square mile open road density, 4.9 miles/square mile total road density).

In the large cumulative effects analysis area, snag and coarse woody debris levels on surrounding parcels vary widely depending on ownership, motorized access, harvest history, and natural disturbance history. Snags and coarse woody debris are frequently collected for firewood, especially near open roads, and firewood gathering occurs in the large cumulative effects analysis area. The Pleasant Valley Road and Lost Prairie Road bisect the large cumulative effects analysis area, providing access for firewood cutting. Overall, road density in the large cumulative effects analysis area is moderate (2.1 miles/square mile open road density, 3.2 miles/square mile total road density) and provides some accessibility for firewood cutting.

ENVIRONMANTAL EFFECTS

Direct and Indirect Effects of the No-Action Alternative on Snags and Coarse Woody Debris

None of the proposed forest management activities would occur. Existing snags would continue to provide wildlife habitats, and new snags would be recruited as trees die. Thus, since: 1) no timber harvesting would alter present or future snag or coarse woody debris abundance, and 2) no changes to human access for firewood harvesting would occur, no direct and indirect effects to snags and coarse woody debris availability associated with wildlife habitat quality would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Snags and Coarse Woody Debris

Some existing snags and snag recruits would be removed from the 554 acres within project area due to timber felling operations. Additional recruitment trees and snags may also be lost following timber harvest due to wind throw. Due to the residential nature of some portions of the project area, human safety would be a concern when selecting snags for retention. Given operability and human safety constraints, existing non-merchantable snags would be left standing where possible on DNRC lands. Across the project area, at least 1 large snag and 1 large recruitment tree (>21 inches dbh) per acre would be retained on

DNRC harvest units (*ARM 36.11.411*). If such large trees and snags are absent, the largest available snags and/or recruitment trees would be retained. Additionally, coarse woody debris would be retained according to DNRC administrative rules (*ARM 26.11.414*). Firewood cutting risk in the project area would not change following the proposed harvest. Approximately 0.3 miles of new roads would be constructed, but these roads would be closed following the proposed harvest. Thus, since: 1) proposed actions would remove some snags and coarse woody debris, 2) accessibility for firewood harvesting would not change, and 3) snags and coarse woody debris would be retained to meet DNRC administrative rules (*ARM 36.11.411, ARM 26.11.414*), minor adverse direct and indirect effects to snags and coarse woody debris availability associated with wildlife habitat quality would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Snags and Coarse Woody Debris

None of the proposed forest management activities would occur. No changes in the availability of snags and coarse woody debris would be expected. Existing snags would continue to provide wildlife habitats, and new snags would be recruited as trees die. Any proposed and ongoing activities on other ownerships may affect the availability of snags and coarse woody debris. Thus, since: 1) no timber harvesting on DNRC lands would alter present or future snag or coarse woody debris abundance, and 2) no changes to human access for firewood harvesting would occur on DNRC lands, no cumulative effects to snags and coarse woody debris availability associated with wildlife habitat quality would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Snags and Coarse Woody Debris

Some existing snags and snag recruits would be removed from the 554 acres proposed for harvest within project area, but retention measures would apply (*ARM 36.11.411, ARM 26.11.414*). Reductions in the availability of coarse woody debris and snags would be additive to any proposed or ongoing actions on other ownerships, however, DNRC is currently unaware of any specific plans. Firewood cutting risk in the large cumulative effects analysis area would not change due to DNRC activities under the Action Alternative because approximately 0.3 miles of road would be constructed, but these roads would be closed post-harvest. Thus, since: 1) proposed actions would be additive to any ongoing and proposed activities that would remove some snags, snag recruits, and coarse woody debris, 2) accessibility for firewood harvesting would not change, and 3) snags and coarse woody debris would be retained to meet DNRC administrative rules (*ARM 36.11.411, ARM 26.11.414*), minor cumulative effects to snags and coarse woody debris availability associated with wildlife habitat quality would be anticipated as a result of the Action Alternative.

FINE-FILTER WILDLIFE ANALYSIS

The fine-filter wildlife analysis discloses the existing conditions of wildlife resources and the anticipated direct, indirect, and cumulative effects that may result from the No-Action and Action Alternatives described in Chapter 2. Wildlife species considered include: 1) species listed as threatened or endangered under the Endangered Species Act of 1973, 2) species listed as sensitive by DNRC, and 3) species managed as big game by DFWP. TABLE W-3 –FINE-FILTER describes how each species was either included in the following analysis, or removed for further analysis. Species were not analyzed further if suitable habitat was not

present in or near the project area, or if proposed activities would not affect their required habitat components.

TABLE W-3 –FINE-FILTER. Status of species considered in the fine-filter wildlife analysis and basis for inclusion or exclusion in further analysis.

	SPECIES/HABITAT	DETERMINATION – BASIS
Threatened and Endangered Species	Canada lynx (*Felis lynx*) Habitat: Subalpine fir habitat types, dense sapling, old forest, deep snow zones	***Included*** – The project area contains 160 acres of suitable lynx habitat.
	Grizzly bear (*Ursus arctos*) Habitat: Recovery areas, security from human activity	***Included*** – A portion of the project area lies within grizzly bear non-recovery occupied habitat (*Wittinger* 2002) associated with the Northern Continental Divide Ecosystem.
Sensitive Species	Bald eagles (*Haliaeetus leucocephalus*) Habitat: Late-successional forest less than 1 mile from open water	*No further analysis conducted* – No bald eagle nests occur in the vicinity of the project area, and no large water bodies suitable for use by nesting eagles occur within 1 mile of any parcel in the project area. Thus, no direct, indirect, or cumulative effects to bald eagles would be expected to occur as a result of either alternative.
	Black-backed woodpeckers (*Picoides arcticus*) Habitat: Mature to old burned or beetle-infested forest	*No further analysis conducted* – No recently (<5 years) burned areas occur in the project area. Thus, no direct, indirect, or cumulative effects to black-backed woodpeckers would be expected to occur as a result of either alternative.
	Coeur d'Alene salamanders (*Plethodon idahoensis*) Habitat: Waterfall spray zones, talus near cascading streams	*No further analysis conducted* – No moist talus or streamside talus habitat occurs in the project area. Thus, no direct, indirect, or cumulative effects to Coeur d'Alene salamanders would be expected to occur as a result of either alternative.
	Columbian sharp-tailed grouse (*Tympanuchus Phasianellus columbianus*) Habitat: Grassland, shrubland, riparian, agriculture	*No further analysis conducted* – No suitable grassland communities occur in the project area. Thus, no direct, indirect, or cumulative effects to Columbian sharp-tailed grouse would be expected to occur as a result of either alternative.
	Common loons (*Gavia immer*) Habitat: Cold mountain lakes, nest in emergent vegetation	*No further analysis conducted* – No suitable lake habitats occur within the project area. Thus, no direct, indirect or cumulative effects to common loons would be expected to occur as a result of either alternative.

	Fishers (*Martes pennanti*) Habitat: Dense mature to old forest less than 6,000 feet in elevation and riparian	***Included*** – Approximately 155 acres of fisher habitat types occur within the project area.
	Flammulated owls (*Otus flammeolus*) Habitat: Late-successional ponderosa pine and Douglas-fir forest	***Included*** – Approximately 325 acres of suitable flammulated owl habitat occur within the project area.
	Gray wolves (*Canis lupus*) Habitat: Ample big game populations, security from human activities	***Included*** – The project area contains approximately 119 acres of the 2010 annual home range of the Tallulah Pack.
	Harlequin ducks (*Histrionicus histrionicus*) Habitat: White-water streams, boulder and cobble substrates	*No further analysis conducted* – No suitable high-gradient stream or river habitats occur in the project area. No direct, indirect or cumulative effects to harlequin ducks would be expected to occur as a result of either alternative.
	Northern bog lemmings (*Synaptomys borealis*) Habitat: Sphagnum meadows, bogs, fens with thick moss mats	*No further analysis conducted* – No suitable sphagnum bogs or fens occur in the project area. Thus, no direct, indirect, or cumulative effects to northern bog lemmings would be expected to occur as a result of either alternative.
	Peregrine falcons (*Falco peregrinus*) Habitat: Cliff features near open foraging areas and/or wetlands	*No further analysis conducted* – No suitable cliffs/rock outcrops for nest sites occur in the project area or within 0.5 miles of the project area. Thus, no direct, indirect, or cumulative effects to peregrine falcons would be anticipated as a result of either alternative.
	Pileated woodpeckers (*Dryocopus pileatus*) Habitat: Late-successional ponderosa pine and larch-fir forest	***Included*** – Approximately 89 acres of suitable pileated woodpecker habitat occur in the project area.
	Townsend's big-eared bats (*Plecotus townsendii*) Habitat: Caves, caverns, old mines	*No further analysis conducted* – No suitable caves or mine tunnels are known to occur in the project area. Thus, no direct, indirect or cumulative effects to Townsend's big-eared bats are anticipated as a result of either alternative.
Big Game Species	Elk (*Cervus canadensis*)	***Included*** – The project area contains mule deer and elk winter range (*unpublished interagency map, 2008*).
	Mule Deer (*Odocoileus hemionus*)	
	White-tailed Deer (*Odocoileus virginianus*)	

THREATENED AND ENDANGERED SPECIES

CANADA LYNX

***Issue**: The proposed activities could reduce landscape connectivity and the availability of suitable Canada lynx habitat types (i.e. summer forage, winter forage, other suitable, temporary non-suitable), reducing the ability of the area to support Canada lynx.*

Introduction

Canada lynx are listed as threatened under the *Endangered Species Act*. Canada lynx are medium-size cats that prey primarily on snowshoe hares and occupy a mosaic of young and mature forests that provide hunting and denning habitats (*Ruediger et al. 2000*). Lynx foraging habitat in western Montana consist of young coniferous stands and dense, mature forested stands, which provide snowshoe hare habitat (*Squires et al. 2010*). Lynx denning habitat typically consists of mature forests with abundant coarse woody debris, which provides hiding cover for kittens (*Squires et al. 2008*). Additionally, lynx typically avoid large openings in the winter; hence, densely forested cover is important for travel and security (*Squires et al. 2010*). Forest management considerations for lynx include providing a mosaic of young and mature lynx habitats and well-connected large patches of mature forested cover occurring in vegetation types preferred by lynx.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the large cumulative effects analysis area described in TABLE W-1 –ANALYSIS AREAS (FIGURE W-1 – ANALYSIS AREAS). The large cumulative effects analysis area represents an area that approximates the size of 2 lynx home ranges (*Ruediger et al. 2000*).

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and Geographical Information System (GIS) analysis of SLI data and suitable lynx habitats. Suitable lynx habitat was subdivided into the following lynx habitat types: 1) winter foraging, 2) summer foraging, 3) other suitable, and 4) temporary non-habitat. Habitat types were classified according to DNRC HCP lynx habitat mapping protocols (*DNRC HCP FEIS Vol. II, Appendix B, pp. B-5 to B-19*) based upon a variety of vegetation characteristics important to lynx and snowshoe hares (i.e. forest habitat type, canopy cover, stand age class, stems/acre, and coarse woody debris). Other suitable lynx habitat is defined as habitat that has the potential to provide connectivity and lower quality foraging habitat. The temporary non-habitat category consists of non-forest and open forested stands that are not expected to be used by lynx until adequate horizontal cover develops. On non-DNRC lands, data identifying the specific types of lynx habitats listed above are not readily available. Therefore, for the purpose of this analysis, the stands considered most likely to provide suitable habitat for lynx were mature forest stands (≥40% canopy cover, >9 inches dbh average) below 6,000 feet elevation. Factors considered in the analysis include: 1) the level of harvesting, 2) the availability of lynx habitat types, and 3) landscape connectivity.

EXISTING CONDITIONS

Canada Lynx

The project area contains 160 acres of suitable lynx habitat (TABLE W-5 –LYNX HABITAT). The remaining 542 acres consists of large openings and forest habitat types that are not appropriate for lynx use. Riparian habitat associated with Class 2 and Class 3 streams in the project area may provide some habitat connectivity for lynx. No saddles or ridge tops occur in the project area that would facilitate landscape connectivity.

The large cumulative effects analysis area contains a total of 3,705 acres (8.0% of analysis area) of potentially suitable lynx habitats including 666 acres of suitable lynx habitats on DNRC-managed lands and approximately 3,039 acres of mature forested habitat on other ownerships. The remaining 42,902 acres are comprised of natural openings, young stands, and sparse stands with low canopy cover. Due to the presence of large open meadows and recent wide-scale influences timber harvesting, the capability of this area to support lynx is low. In the vicinity of the project area, connectivity of mature forested habitat is low, likely inhibiting lynx travel, especially in the winter (see *MATURE FORESTED COVER AND CONNECTIVITY* in the coarse filter analysis section for further information).

TABLE W-5 –LYNX HABITAT. Estimates of existing and post-harvest lynx habitats within the project area. For the existing and post-harvest categories, percent refers to the percent of the total lynx habitat each habitat category represents.

LYNX HABITAT CATEGORY	EXISTING	ACRES AFFECTED	POST-HARVEST
Summer Foraging	0	0	0
Winter Foraging	105 (65.6%)	105	0
Other Suitable	55 (34.4%)	55	150 (90.0%)
Temporary Non-habitat	0	0	10 (10.0%)
Total Acres Lynx Habitat	*160*	*160*	*160*

ENVIRONMANTAL EFFECTS

Direct and Indirect Effects of the No-Action Alternative on Canada Lynx

None of the proposed forest management activities would occur. Suitable lynx habitat present in the project area would persist and connectivity would remain low due to the lack of mature forested habitat. Thus, since: 1) no changes to lynx habitat type availability would occur, and 2) no changes to landscape connectivity would occur, no adverse direct or indirect effects to Canada lynx associated with landscape connectivity and habitat type availability would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Canada Lynx

The proposed activities would affect 160 acres of suitable lynx habitats (TABLE W-5 – LYNX HABITAT) After harvest, the classification of 10 acres of winter foraging habitat would be reclassified as temporary non- habitat due to lack of canopy cover in the understory and overstory (*DNRC HCP FEIS Vol. II, Appendix B, pp. B-5 to B-19*). The remaining 105 acres of winter foraging habitat would be reclassified as other suitable post-harvest because it is expected to retain adequate understory and overstory canopy cover for some lynx use. To ensure that forest structural attributes preferred by snowshoe hares remain following harvest, dense patches of advanced regeneration would be retained where possible, especially within lynx winter forage habitat (as per *LY-HB4*, *DNRC HCP FEIS Vol. II*). Additionally, coarse woody debris would be retained in accordance with DNRC administrative rules (*ARM 36.11.414)* and retention of downed logs ≥15 inch diameter would be emphasized. Landscape connectivity is currently low due to the lack of mature forested habitat available in the project area. Riparian harvest would occur in potential lynx travel corridors, but vegetation retention measures would apply through the implementation of the HCP aquatic riparian timber harvest conservation strategy. If present in the vicinity of the project area, lynx could be temporarily displaced by forest management activities for up to 3 years due to disturbance caused by motorized activities. Thus, since: 1) lynx suitable habitat availability would be reduced by 10 acres, 2) lynx winter forage habitat availability would be reduced by 105 acres, but habitat would remain suitable for lynx use, 3) patches of advanced regeneration would be retained where feasible, especially in winter forage habitat, 4) landscape connectivity would be reduced, but vegetation retention measures would apply within riparian lynx travel corridors, moderate adverse direct and indirect effects to Canada lynx associated with landscape connectivity and habitat type availability would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Canada Lynx

None of the proposed forest management activities would occur. The availability of suitable lynx habitats and landscape connectivity would remain the same on DNRC-managed lands, but may change on other ownerships. Thus, since: 1) no changes to lynx habitat type availability would occur, and 2) no changes to landscape connectivity would occur on DNRC lands, no cumulative effects to Canada lynx associated with landscape connectivity and habitat type availability would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Canada Lynx

The proposed activities would affect 160 acres (4.3%) of the 3,708 acres of potentially suitable lynx habitat available in the large cumulative effects analysis area. After harvest, the classification of 10 acres of winter forage habitat would be reclassified as temporary non-suitable habitat due to lack of canopy cover in the understory and overstory (*DNRC HCP FEIS Vol. II, Appendix B, pp. B-5 to B-19*). The remaining 150 acres of winter forage habitat would be reclassified as other forage habitat, but would remain suitable for lynx use. Changes to lynx habitat type availability and habitat connectivity would be additive to any ongoing or proposed activities on other ownerships, although DNRC is unaware of any specific plans at this time. Riparian harvest would occur in potential lynx travel corridors, but vegetation retention measures would apply through the implementation of the HCP aquatic riparian timber harvest conservation strategy to maintain threshold levels of cover suitable to facilitate travel. Additionally, dense patches of advanced regeneration would be

retained where possible, especially within lynx winter foraging habitat (as per *LY-HB4*, *DNRC HCP FEIS Vol. II*). Coarse woody debris would be retained in accordance with DNRC administrative rules (*ARM 36.11.414)* and retention of downed logs ≥15 inch diameter would be emphasized. If present in the vicinity of the project area, lynx could be temporarily displaced by forest management activities for up to 3 years. Thus, since: 1) lynx suitable habitat availability would be reduced by 10 acres, 2) lynx winter forage habitat availability would be reduced by 105 acres, but habitat would remain suitable for lynx use, 3) patches of advanced regeneration would be retained where feasible, especially in winter forage habitat, 4) landscape connectivity would be reduced, but vegetation retention measures would apply within riparian lynx travel corridors, and 5) existing habitat conditions suitable for use by lynx in this area at the scale of a lynx home range (regardless of proposed activities) are very poor, minimal adverse cumulative effects to Canada lynx associated with landscape connectivity and habitat type availability would be anticipated as a result of the Action Alternative.

GRIZZLY BEAR

> ***Issue****: The proposed activities could alter the availability of grizzly bear visual screening cover and could increase human access, which could displace bears and increase the risk of human-caused bear mortality.*

Introduction

Grizzly bears are opportunistic omnivores that inhabit a variety of habitats in Montana. Preferred grizzly bear habitats include avalanche chutes, fire-mediated shrub fields, and riparian areas, all of which provide seasonal food sources (*Servheen 1983, McLellan and Hovey 2001*). Grizzly bears are currently listed as Threatened under the *Endangered Species Act of 1973* and primary threats are related to human-bear conflicts and long-term habitat loss associated with human development (*Mace and Waller 1997a*). Forest management considerations for grizzly bears include providing visual screening along open roads, minimizing access and the construction of new roads, and reducing disturbance levels during the non-denning season, especially in the spring period when grizzly bears are nutritionally stressed.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the large cumulative effects analysis area described in TABLE W-1 –ANALYSIS AREAS (FIGURE W-1 – ANALYSIS AREAS). The large cumulative effects analysis area represents an area large enough to support a female grizzly bear home range (*Mace and Waller 1997b*).

Analysis Methods

Analysis methods include field evaluations, Geographical Information System (GIS) of SLI data, and aerial photograph interpretation to identify potential hiding cover, identify spring habitat, and estimate open and restricted road density. Grizzly bear visual screening is defined as vegetation that could hide 90% of a grizzly bear at a distance of 200 feet. Visual screening was identified by evaluating forest stand size class and the total crown density of all trees in the stand. Seedlings/sapling stands are included in hiding cover estimates if they are >4 feet tall and contain ≥350 trees/acre. On non-DNRC lands the acreage of stands with ≥40% canopy cover provided by trees >9 inches dbh on average was queried

to estimate the availability of hiding cover. Spring habitat was defined as habitat located below 4,900 feet within grizzly bear non-recovery occupied habitat (*Wittinger 2000*) as per GB-NR3 (*DNRC HCP FEIS Vol. II*). Factors considered in the analysis included: 1) the degree of harvesting, 2) the availability of visual screening for hiding cover, 3) the location of spring habitat, and 4) open and restricted road density.

EXISTING CONDITIONS

Grizzly Bears

The project area contains 1 parcel (302 acres; Unit 18-1) located within grizzly bear non-recovery occupied habitat (NROH) situated near the Northern Continental Divide Ecosystem (*USFWS 1993*). NROH consists of occupied areas associated with grizzly bear recovery zones in Montana that were mapped by grizzly bear researchers and managers to address increased sightings and encounters of grizzly bears in habitats outside of recovery zones (*Wittinger 2002*). The northerly half of Section 18 T28N, R26W is the only parcel in the project area proposed for harvest that is located in NROH. Additionally, this parcel is located below 4,900 ft and is considered spring habitat (*GB-NR3*, *DNRC HCP FEIS Vol. II*). There are no recent records of grizzly bears in the project area (MNHP tracker data); however, in 1998, a dead grizzly bear was reported on Lost Trail NWR, which is located adjacent to the project area (MNHP tracker data). Use of the project area by grizzly bears is possible. Approximately 343 acres of visual screening for hiding cover is available in the project area. Low elevation riparian habitat can provide important foraging habitat for bears, especially in the spring (*Servheen 1983*). Such riparian habitat associated with Class 2 (0.1 miles) and Class 3 (2.2 miles) streams is available in the project area (*ARM 36.11.403(16)(17)*). Other important grizzly bear habitats including fire-mediated shrub fields and avalanche chutes are not present in the project area. Currently, open road density in the project area is moderate at approximately 1.3 miles/square mile and the density of all roads is relatively high at 4.9 miles/square mile.

The large cumulative effects analysis area contains 16,491 acres of NCDE NROH habitat (*USFWS 1993*, *Wittinger 2002)*. The MNHP Tracker Database contains a record of a dead grizzly bear found on the Lost Trail NWR in 1998; however there are no recent records of grizzly bear sightings in the large cumulative effects analysis area. A total of 4,004 acres (8.6% analysis area) provide visual screening for grizzly bears. Approximately 962 acres of visual screening is available on DNRC-managed lands across the large cumulative effects analysis area, and approximately 3,042 acres of mature forested habitat providing visual screening is available on other neighboring ownerships. Some residential development is present in the Pleasant Valley area, which may pose a risk to grizzly bears (e.g. attractants such as garbage and domestic animals). Open and restricted road density in the large cumulative effects analysis area is moderate (2.1 miles/square mile open road density, 3.2 miles/square mile density of all roads).

ENVIRONMANTAL EFFECTS

Direct and Indirect Effects of the No-Action Alternative on Grizzly Bears

None of the proposed forest management activities would occur. No changes to grizzly bear habitat would be expected. Visual screening and open and restricted road density would remain the same. Thus, since: 1) no timber harvesting would alter present visual

screening, and 2) no changes to open or restricted road density would occur, no direct or indirect effects associated with grizzly bear displacement or human-caused bear mortality risk would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Grizzly Bears

The project area currently contains 343 acres of visual screening for hiding cover. Of these acres, 334 (97.3%) would be affected by the proposed activities. The proposed harvest would reduce canopy cover in these areas to <40%, potentially reducing the effectiveness of grizzly bear visual screening. Logging equipment could remove some shrubs and other herbaceous materials currently providing visual screening, although vegetation would be retained where possible, especially near open roads. Riparian harvest would occur, but vegetation retention measures would apply through the implementation of the HCP aquatic riparian timber harvest conservation strategy. Approximately 0.3 miles of restricted road would be constructed, and no new open roads would be constructed (post-harvest road density: 1.3 miles/square mile open roads, 6.4 miles/square mile all roads). The proposed activities would occur for up to 3 years. To provide additional protection for grizzly bears in the spring period motorized activities on restricted roads and commercial harvest would be restricted on parcels located in NROH from April 1- June 15. Thus, since: 1) canopy cover and shrubs providing visual screening would be removed, but visual screening would be retained where possible, especially near open roads, 2) total road density would increase, but open road density would not change, and 3) commercial harvest and motorized activities on restricted roads would be restricted from April 1-June 15 on parcels located in NROH (*GB-NR3, DNRC HCP FEIS Vol. II*), minor adverse direct or indirect effects associated with grizzly bear displacement or human-caused bear mortality risk would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Grizzly Bears

None of the proposed forest management activities would occur. No changes to grizzly bear habitat would be expected. Visual screening and open road density would remain the same within the project area, but may change on other ownerships. Thus, since: 1) no timber harvesting would alter present visual screening, and 2) no changes to restricted or open road density would occur, no cumulative effects associated with grizzly bear displacement or human-caused bear mortality risk would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Grizzly Bears

The proposed activities would affect 334 acres (8.3%) of the 4,004 acres of visual screening available in the large cumulative effects analysis area. Under the Action Alternative, approximately 0.3 miles of restricted road would be constructed, slightly increasing the total road density; however, no additional open roads are planned for construction. Reductions in visual screening would be additive to any proposed or ongoing projects on other ownerships, although DNRC is unaware of any specific plans at this time. If present in the vicinity of the project area, grizzly bears could be displaced for up to 3 years. To provide additional protection for grizzly bears in the spring period motorized activities on restricted roads and commercial harvest would be restricted on parcels located in NROH from April 1- June 15. Thus, since: 1) canopy cover and shrubs providing visual screening would be removed, but visual screening would be retained where possible, especially near open roads, 2) total road density would increase, but open road density

would not change, and 3) commercial harvest and motorized activities on restricted roads would be restricted from April 1-June 15 on parcels located in NROH (*GB-NR3, DNRC HCP FEIS Vol. II*), minor adverse cumulative effects associated with grizzly bear displacement or human-caused bear mortality risk would be anticipated as a result of the Action Alternative.

SENSATIVE SPECIES

FISHERS

Issue: *The proposed activities could reduce the availability and connectivity of preferred fisher habitats and increase human access, which could reduce habitat suitability and increase trapping mortality.*

Introduction

In the Rocky Mountains, fishers prefer late-successional moist coniferous forests (*Jones 1991*). Preferred fisher habitat typically contains large live trees, snags, and logs, which are used for resting and denning sites, and dense canopy cover, which is important for snow intercept (*Jones 1991*). Fishers generally avoid large openings in canopy cover, non-forested habitats, and shrub-seedling stands. The diet of fishers in Montana consists primarily of snowshoe hares, ungulate carrion, and small mammals (*Roy 1991*). Forest-management considerations for fisher involve providing upland and riparian resting and denning habitats and maintaining a network of travel corridors.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the medium cumulative effects analysis area described in TABLE W-I –ANALYSIS AREAS (FIGURE W-1 – ANALYSIS AREAS). The cumulative effects analysis area is defined according to geographic features (i.e. ridgelines), which are likely to restrict movements of fishers in the vicinity of the project area, providing a reasonable analysis area for fishers that could be influenced by project-related activities.

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and Geographical Information System (GIS) analysis of travel corridors, preferred fisher cover type availability (*ARM 36.11.403(60)*), and fisher habitat structure. Preferred fisher cover type classifications considered in the analysis include: 1) upland fisher habitat, and 2) riparian fisher habitat. Classification of these two habitat types depends upon proximity to streams. Riparian fisher habitat is located within 100 feet of Class 1 streams or within 50 feet of Class 2 streams (*ARM 36.11.440(b)*). The remaining preferred fisher cover type habitat is considered upland fisher habitat. Habitat structure considered appropriate for fisher use includes stands of sawtimber size class trees (≥9 inches dbh) with 40-70+% crown density. Potential fisher habitat (riparian, upland) on other ownerships was identified by examining mature forested habitat and proximity of mature forested habitat (≥40% cover, >9 inches dbh average) to perennial and intermittent streams. Factors considered in the analysis include: 1) the degree of harvesting, 2) availability and structure of preferred fisher habitats (upland, riparian), 3) landscape connectivity, and 4) human access.

EXISTING CONDITIONS

Fishers

The project area contains 154 acres of preferred fisher cover types including 1 acre of riparian fisher habitat associated with a Class 2 stream (Section 20 T28N, R26W). All acres of preferred fisher cover type habitat in the project area contain structure necessary for fisher use (sawtimber size class ≥9 inches dbh, 40-70+% crown density). Open road density is moderate (1.3 miles/square mile open road density, 4.9 miles/square mile total road density), thus there is moderate level of access that could facilitate trapping. The availability of mature forested habitat is moderate (50.6% project area) and the majority of mature forested patches are continuous and thus connectivity within the project area is high. Riparian vegetation associated with Class 2 and Class 3 streams in the project area may provide travel corridors between patches of mature forested habitat. However, although fisher habitat in the project area is suitable for fisher use, the capability of this area to support fisher is low due the wide-scale influences timber harvesting in the vicinity of the project area and the low availability of suitable fisher habitat.

The medium cumulative effects analysis area contains approximately 1,047 acres of fisher habitat (4.5% of analysis area), including 155 acres of fisher habitat on DNRC-managed lands and an additional 892 acres of mature forested habitat on other ownerships, which are likely to provide suitable fisher habitat. The remaining 22,404 acres in the medium cumulative effects analysis area consist of young stands, sparsely vegetated stands, and natural openings that are unlikely to contain adequate structure for fisher use. In the vicinity of the project area, mature forested habitat patch size is variable (average: 29 acres, range: 3-195 acres) and scattered throughout the medium cumulative effects analysis area. Due to the low availability of mature forested habitat, the area is not likely to provide high quality fisher habitat. Connectivity in the medium cumulative effect analysis is low due to the patchy distribution of mature forested habitats. Open road density is moderate at 2.0 miles/square mile and total road density is 3.1 miles/square mile, thus trapping vulnerability is moderate.

ENVIRONMANTAL EFFECTS

Direct and Indirect Effects of the No-Action Alternative on Fishers

None of the proposed forest management activities would occur. No changes to fisher habitat suitability or trapping risk would occur in the project area. Thus, since: 1) no change in the structure of preferred fisher habitats would occur, 2) no change in landscape connectivity would occur, and 3) no changes to human access would occur that would facilitate trapping, no direct or indirect effects to fisher associated with habitat suitability and trapping risk would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Fishers

The proposed activities would affect 154 acres (99.4%) of the 155 acres of fisher habitat present in the project area, including the 1 acre of riparian fisher habitat. The proposed activities would change the structure of these habitats, reducing canopy cover to <40%, thus the structure of current fisher habitat would be expected to become unsuitable for

fisher use. However, fisher use of the project area is likely limited due to the lack of suitable habitat structure available in the vicinity of the project area. Additionally, the availability of some important habitat characteristics (i.e. snags, coarse woody debris) could be reduced by harvest activities; although retention of deadwood would meet DNRC administrative rules (*ARM 36.11.411, ARM 26.11.414*). Within the riparian fisher habitat, 75% of the stand would be retained in saw timber size class in moderate to well-stocked density (*ARM 36.11.440(b)*). Approximately 0.3 miles of restricted road would be constructed, and no new open roads would be constructed (post-harvest road density: 1.3 miles/square mile open roads, 6.4 miles/square mile all roads). Connectivity of mature forested habitats suitable for fisher use would be expected to decrease under the Action Alternative. If present in the vicinity of the project area, fisher could be temporarily displaced by forest management activities for up to 3 years. Thus, since: 1) structural changes to fisher habitat would occur, but snags and coarse woody debris would be retained (*ARM 36.11.411, ARM 26.11.414),* 2) landscape connectivity would be reduced, and 3) open road density would not change, but 0.3 miles of restricted roads would be constructed and trapping risk would increase slightly, minor adverse direct and indirect effects to fisher associated with habitat suitability and trapping risk would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Fishers

None of the proposed forest management activities would occur. Fisher habitat availability, habitat structure, and landscape connectivity would remain the same within the project area, but may change on other ownerships. Thus, since: 1) no change in the structure of preferred fisher habitats would occur, 2) no change in landscape connectivity would occur, and 3) no changes to human access would occur that would facilitate trapping, no cumulative effects to fisher associated with habitat suitability and trapping risk would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Fishers

The proposed activities would affect 154 acres (14.7%) of the 1,047 acres of potential fisher habitat available in the medium cumulative effects analysis area. The proposed activities would change the structure of these habitats, reducing canopy cover to <40%, thus the structure of current fisher habitats proposed for harvest would be expected to become unsuitable for fisher use. However, the likelihood of fisher use of the project area is low due to the lack of suitable habitat structure available in the medium cumulative effects analysis area and thus adverse affects to fisher are expected to be limited. The availability of some important habitat characteristics (i.e. snags, coarse woody debris) could be reduced by harvest activities; although retention of deadwood would meet DNRC administrative rules (*ARM 36.11.411, ARM 26.11.414*). Harvest would occur within 1 acre of riparian fisher habitat, but 75% of the stand would be retained in saw timber size class in moderate to well-stocked density (*ARM 36.11.440(b)*). Connectivity of fisher habitats would be expected to remain low. Any adverse affects to fisher would be additive to any proposed or ongoing sales in the medium cumulative effects analysis area, although DNRC is unaware of specific plans at this time. If present in the vicinity of the project area, fisher could be temporarily displaced by forest management activities for up to 3 years. Thus, since: 1) structural changes to fisher habitat would occur, but snags and coarse woody debris would be retained (*ARM 36.11.411, ARM 26.11.414),* 2) landscape connectivity would be reduced, and 3) 0.3 miles of restricted roads would be constructed, minor adverse

cumulative effects to fisher associated with habitat suitability and trapping risk would be anticipated as a result of the Action Alternative.

FLAMMULATED OWLS

Issue*: The proposed activities could alter the structure of flammulated owl preferred habitat types, which could reduce habitat suitability for flammulated owls.*

Introduction

Flammulated owls are small, migratory, insectivorous forest owls that inhabit old, open stands of warm-dry ponderosa pine and cool-dry Douglas-fir forests in the western United States (*McCallum 1994*). Flammulated owls are secondary cavity nesters, typically nesting in 12-25 inch dbh aspen, ponderosa pine, or Douglas-fir cavities excavated by pileated woodpeckers or northern flickers. Forest management considerations for flammulated owls include providing open, dry stands of ponderosa pine and Douglas-fir and retaining snags for nesting.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE W-I – ANALYSIS AREAS). The analysis area for cumulative effects is the medium cumulative effects analysis area described in TABLE W-I –ANALYSIS AREAS (FIGURE W-I – ANALYSIS AREAS). This scale represents an area large enough to support several pairs of flammulated owls (*McCallum 1994*).

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of available habitats. SLI data were used to identify preferred flammulated owl habitat types (*ARM 36.11.403(28*)). Canopy cover, trees/acre, and cover type were considered in analyses of flammulated owl habitat availability and structure. Factors considered in the analysis include: 1) the degree of harvesting, and 2) the structure of flammulated owl preferred habitats.

EXISTING CONDITIONS

Flammulated Owls

The project area contains 325 acres of flammulated owl habitat. This habitat is composed primarily of ponderosa pine, with some western larch and Douglas-fir stands with approximately 10-50% canopy cover. Snag density and abundance in the project area is low, which may affect the availability of high-quality nesting habitat (see *SNAGS AND COARSE WOODY DEBRIS* in the coarse-filter analysis section for additional information).

The medium cumulative effects analysis area contains approximately 16,632 acres (70.0%) of open forested conditions (≤40% canopy cover), which includes 488 acres of DNRC-managed flammulated owl habitat and 16,144 acres of open forested habitat on other

ownerships. Overall, road density in the analysis is moderate (2.0 miles/square mile open road density, 3.1 miles/square mile total road density) and provides some accessibility for firewood cutting. Due to motorized access and the harvesting history in the medium cumulative effects analysis area, average stand age is young and snag availability is likely limited for flammulated owl nesting.

ENVIRONMANTAL EFFECTS

Direct and Indirect Effects of the No-Action Alternative on Flammulated Owls

None of the proposed forest management activities would occur. Timber harvest would not occur in DNRC-managed preferred flammulated owl habitats. Thus, since there would be no change in availability or structure of preferred flammulated owl habitats, no direct or indirect effects to flammulated owl habitat suitability would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Flammulated Owls

Timber harvest would occur in 282 of the 325 acres (86.7%) of preferred flammulated owl cover types available in the project area. The proposed activities would open stands from 5- 40% canopy cover, improving stand structure suitability for flammulated owls in many areas of the project area. Additionally, the proposed harvest would favor leaving ponderosa pine, which is preferable for flammulated owls (*ARM 36.11.437(b)*). Some snags could be removed by the proposed harvest, but at least 1 large snag and 1 large snag recruitment tree per acre (>21 inches dbh) would be retained (*ARM 36.11.411*). Flammulated owls are tolerant of human disturbance (*McCallum 1994*), however disturbance associated with harvesting could adversely affect flammulated owls for up to 3 years, should they be present in the project area. Flammulated owls would not be affected by activities occurring in the winter months when the birds have migrated to their winter range. Thus, since: 1) no change in the availability of preferred flammulated owl habitats would occur, and 2) changes in structure and cover type would generally increase flammulated owl habitat suitability, minor beneficial direct and indirect effects to flammulated owl habitat suitability would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the No-Action Alternative on Flammulated Owls

None of the proposed forest management activities would occur. Flammulated owl habitat availability and structure would remain the same in the project area, but may change on other ownerships. Thus, since no change in the availability or structure of preferred flammulated owl habitats would occur, no cumulative effects to flammulated owl habitat suitability would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Flammulated Owls

The proposed activities would occur in 282 acres (1.7%) of the 16,632 acres of potential flammulated owl habitat available in the medium cumulative effects analysis area. The proposed activities would open stands to 5-40% canopy cover, and favor retention of ponderosa pine, improving stand structure suitability for flammulated owls in many portions of the project area (*ARM 36.11.437(b)*). DNRC is unaware of any proposed or ongoing projects in the medium cumulative effects analysis area that could affect flammulated owl

habitat suitability. The proposed activities could disturb flammulated owls for up to 3 years should they be present in the vicinity of the project area, however, flammulated owls would be absent from the area for a portion of this time due to seasonal migration. Thus, since: 1) no change in the availability of preferred flammulated owl habitats would occur, and 2) changes in structure and cover type would generally increase flammulated owl habitat suitability, minor beneficial cumulative effects to flammulated owl habitat suitability would be anticipated as a result of the No-Action Alternative.

PILEATED WOODPECKER

Issue: *The proposed activities could reduce tree density and alter the structure of mature forest stands, which could reduce habitat suitability for pileated woodpeckers.*

Introduction

Pileated woodpeckers require mature forest stands with large dead or defective trees for nesting and foraging. Cavities created by pileated woodpeckers are ecologically important and are often used in subsequent years by a variety of wildlife species for nesting and roosting. Pileated woodpeckers prefer to nest in ≥20 inch dbh western larch, ponderosa pine, cottonwood, or quaking aspen. The diet of the pileated woodpecker consists primarily of carpenter ants, which inhabit large downed logs, stumps, and snags. Forest management considerations for pileated woodpeckers include providing mature cottonwood and mixed conifer stands with large snags and coarse-woody debris.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the medium cumulative effects analysis area described in TABLE W-1 –ANALYSIS AREAS (FIGURE W-1 – ANALYSIS AREAS). This scale provides a sufficient area to support multiple pairs of pileated woodpeckers (*Bull and Jackson 1995*).

Analysis Methods

Analysis methods include field evaluation, aerial photograph interpretation, and GIS analysis of available habitats. SLI data were used to identify preferred pileated woodpecker habitat (*ARM 36.11.403(58*)). Factors considered in the analysis include: 1) the degree of harvesting and 2) the structure of pileated woodpecker preferred habitat types.

EXISTING CONDITIONS

Pileated Woodpeckers

The project area contains 89 acres of pileated woodpecker habitat. This habitat is composed primarily of ponderosa pine, with some western larch and Douglas-fir stands with approximately 10-50% canopy cover. Snag and coarse woody debris availability in the project area is low, which may affect the availability of nesting and foraging habitat (see

SNAGS AND COARSE WOODY DEBRIS in the coarse-filter analysis section for additional information).

The medium cumulative effects analysis area contains 968 acres (4.1% of analysis area) of potential pileated woodpecker habitat, which includes 100 acres of DNRC-managed pileated woodpecker habitats and an 868 addition acres of mature forested habitat (100+ years, ≥40% canopy cover) on other ownerships. Overall, road density in the analysis is moderate (2.0 miles/square mile open road density, 3.1 miles/square mile total road density) and provides some accessibility for firewood cutting. Due to motorized access and the harvesting history in the medium cumulative effects analysis area, average stand age is young and snag availability and coarse woody debris availability for nesting and foraging is likely limited.

ENVIRONMANTAL EFFECTS

Direct and Indirect Effects of the No-Action Alternative on Pileated Woodpeckers

None of the proposed forest management activities would occur. Timber harvest would not occur in DNRC-managed pileated woodpecker habitats that occur in the project area. Thus, since no change in the structure of pileated woodpecker habitat would occur, no direct or indirect effects to pileated woodpecker habitat suitability would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Pileated Woodpeckers

The proposed activities would occur in 79 acres (88.8%) of the 89 acres of pileated woodpecker habitat available in the project area. The proposed activities would open stands from 5- 40% canopy cover, reducing stand structure suitability for pileated woodpeckers. However, the proposed harvest would favor leaving ponderosa pine, which is preferable for pileated woodpeckers (*ARM 36.11.449(1)(b)*). Some snags could be removed by the proposed harvest, but at least 1 large snag and 1 large snag recruitment tree per acre (>21 inches dbh) would be retained (*ARM 36.11.411*). Disturbance associated with harvesting could adversely affect pileated woodpeckers for up to 3 years, should they be present in the project area. Thus, since structural changes would occur, but mitigation would include retention of snags and coarse woody debris (*ARM 36.11.411, ARM 36.11.414*), moderate adverse direct and indirect effects to pileated woodpecker habitat suitability would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the No-Action Alternative on Pileated Woodpeckers

None of the proposed forest management activities would occur. Pileated woodpecker habitat availability would remain the same in the project area, but may change on other ownerships in the medium cumulative effects analysis area. Thus, since no change in the structure of pileated woodpecker habitat would occur, no cumulative effects to pileated woodpecker habitat suitability would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Pileated Woodpeckers

The proposed activities would occur in 79 acres (8.2%) of the 968 acres of mature forested habitat in the medium cumulative effects analysis area providing potential pileated woodpecker habitat. The proposed activities would open stands to 5-40% canopy cover,

reducing habitat suitability for pileated woodpeckers. However, the proposed harvest would favor leaving ponderosa pine, which is preferable for pileated woodpeckers (*ARM 36.11.449(1)(b)*). DNRC is unaware of any proposed or ongoing projects in the medium cumulative effects analysis area that could affect pileated woodpecker habitat suitability. The proposed activities could disturb pileated woodpecker for up to 3 years should they be present in the vicinity of the project area. Thus, since: 1) structural changes would occur, but mitigation would include retention of snags and coarse woody debris, and 2) existing habitat conditions suitable for use by pileated woodpeckers in this area (regardless of proposed activities) are very poor, minor adverse cumulative effects to pileated woodpecker habitat suitability would be anticipated as a result of the Action Alternative.

GRAY WOLVES

Issue: *The proposed activities could disturb gray wolves and reduce winter range habitat quality for big game, which could displace gray wolves from denning and rendezvous sites and reduce prey availability.*

Introduction

Wolves are wide-ranging opportunistic carnivores that prey on ungulates. In general, wolf densities are positively correlated to prey densities (*Fuller et al. 1992*). Wolves prey primarily on white-tailed deer, and, to a lesser extent, elk and moose, in northwest Montana (*Kunkel et al. 1999*). However, some studies have shown that wolves may prey upon elk more frequently during certain portions of the year (particularly winter) or in areas where elk numbers are higher (*Arjo et al. 2002, Kunkel et al. 2004, Garrott et al. 2006*). Thus, reductions in big game populations and/or winter range productivity could be indirectly detrimental to wolf populations. Forest management considerations for wolves include restricting disturbance near den and rendezvous sites and promoting habitat characteristics necessary for healthy big game populations.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the large cumulative effects analysis area described in TABLE W-1 –ANALYSIS AREAS (FIGURE W-1 – ANALYSIS AREAS). This scale approximates an area large enough to support a wolf pack (*based upon DFWP wolf pack home range data, 2010*).

Analysis Methods

Analysis methods include field evaluation, aerial photograph interpretation, and GIS analysis of available habitats. Factors considered in the analysis include: 1) the degree of harvesting, 2) the location of any known den or rendezvous sites, and 3) big game winter range habitat characteristics.

EXISTING CONDITIONS

Gray Wolves

The project area contains 119 acres of the estimated 2010 annual home range of the Tallulah Pack. No wolf rendezvous sites, den sites, or wolf use of the project area have

been documented (*K. Laudon, DFWP wolf management specialist, 2011, personal communication*); however, wolf use of the area could occur at any time. The project area is identified as elk (702 acres) and mule deer (302 acres) winter range by DFWP (*unpublished interagency map, 2008*). The project area consists primarily of stands with moderately closed canopy cover with some dense pockets of canopy cover (70%), providing limited thermal cover for big game. The project are may provide some access to prey, should wolves use the area (see *BIG GAME* under sensitive species for further information).

The large cumulative effects analysis area contains 16,281 acres of the estimated home range of the Tallulah Pack. The area is identified as elk and mule deer winter range by DFWP (*unpublished interagency map, 2008*). The large cumulative effects analysis area contains approximately 35,514 acres (76.2% analysis area) of elk winter range and 8,660 acres (18.6% analysis area) of mule deer winter range (*unpublished interagency map, 2008*). The availability of mature forested habitat is fairly low in the large cumulative effects analysis area due to intensive logging on private corporate timberlands during the last several decades. Thus, habitat quality of big game winter range in the large cumulative effects analysis area is low and prey densities may be less than would be expected under more favorable habitat conditions (see *BIG GAME* under sensitive species for further information).

ENVIRONMANTAL EFFECTS

Direct and Indirect Effects of the No-Action Alternative on Gray Wolves

None of the proposed forest management activities would occur. Wolves would not be disturbed by forest management activities and big game winter range available in the project area would remain intact. Thus, since: 1) no disturbance to wolf den or rendezvous sites would occur, and 2) no change in big game winter range habitat characteristics would occur, no direct or indirect effects to wolves associated with displacement or changes in prey availability would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Gray Wolves

The proposed activities would affect 554 acres (78.9%) of elk winter range and 210 acres (69.5%) of mule deer winter range. The proposed activities would reduce canopy cover in 353 acres of mature forested habitat currently providing thermal cover to <40%, reducing the capacity of these areas to provide snow intercept and reduce wind velocity. However, advanced regenerating conifers (>6 feet height) and some canopy cover (10-25%) would be retained, providing some residual cover. Additionally, there are no known wolf rendezvous or den sites in the project area. However, if documented in the vicinity of the project area, mechanized activities would be restricted within 1 mile of wolf dens (*ARM 33.11.430(1)(a)*) and 0.5 miles of wolf rendezvous sites (*ARM 33.11.430(1)(b)*). Wolf use of the area is possible, and if present in the vicinity of the project area, wolves could be displaced by forest management activities for up to 3 years. Thus, since: 1) wolf den or rendezvous sites do not occur in the vicinity of the project area, but restrictions would apply if documentation occurs (*ARM 33.11.430(1)(a)(b)*), and 2) some canopy cover would be removed, but some canopy cover and advanced regeneration would be retained to provide limited big game thermal cover, minor adverse direct and indirect effects to wolves

associated with displacement or changes in prey availability would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Gray Wolves

None of the proposed forest management activities would occur. Wolves would not be disturbed by forest management activities on DNRC lands. Big game winter range availability in the project area would not change, but may change on other ownerships. Thus, since: 1) no disturbance to wolf den or rendezvous sites would occur and 2) no change in big game winter range habitat characteristics would occur, no direct or indirect effects to wolves associated with displacement or changes in prey availability would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Gray Wolves

The proposed harvest would reduce canopy cover to <40% within 353 (9.7%) of the 3,645 acres of mature habitat providing thermal cover for big game in the large cumulative effects analysis area. However, advanced regenerating conifers (>6 feet height) and some canopy cover (10-25%) would be retained, providing some residual cover for big game. The alteration of canopy cover would be additive to any proposed and ongoing activities occurring in the large cumulative effects analysis area, although DNRC is unaware of any specific plans at this time. There are no known rendezvous or den sites on DNRC lands in the large cumulative effects area. However, if documented in the vicinity of the project areas, mechanized activities would be restricted within 1 mile of wolf dens (*ARM 33.11.430(1)(a)*) and 0.5 miles of wolf rendezvous sites (*ARM 33.11.430(1)(b)*). Thus, since: 1) wolf den or rendezvous sites do not occur in the vicinity of the project area, but restrictions would apply if documentation occurs (*ARM 33.11.430(1)(a)(b)*), and 2) some canopy cover would be removed, but some canopy cover and advanced regeneration would be retained to provide limited big game thermal cover, minor adverse cumulative effects to wolves associated with displacement or changes in prey availability would be anticipated as a result of the Action Alternative.

BIG GAME WINTER RANGE

> ***Issue:*** *The proposed activities could reduce cover, which could reduce the quality of big game winter range habitat.*

Introduction

Big game, including elk, mule deer, and white-tailed deer require areas with adequate amounts of cover and forage at lower elevations during winter. Effective big game winter range contains ample mid-story and overstory, which minimizes severe winter conditions by reducing wind velocity and providing snow intercept, enabling big game to move across the landscape and access forage with less energy expenditure. Forest management considerations for big game include providing adequate hiding cover and ample overstory, which ameliorate the effects of harsh weather conditions in winter.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the large cumulative effects analysis area described in TABLE W-1 –ANALYSIS AREAS (FIGURE W-1 – ANALYSIS AREAS). The large cumulative effects analysis area is defined according to geographic features including watershed boundaries (i.e. ridgelines), which would confine movements of local wintering big game animals in the vicinity of the project area, and provides a reasonable biological analysis unit for local elk and mule deer that could be influenced by project-related activities.

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of available big game winter range (*unpublished interagency map, 2008*). The availability of mature forested habitat (≥40% canopy cover, >9 inch dbh average) was used to assess the quality of big game winter range in the medium cumulative effects analysis area. Factors considered in the analysis include: 1) the degree of timber harvesting, 2) the availability and structure of big game winter range.

EXISTING CONDITIONS

Big Game Winter Range

The project area is identified as elk (702 acres) and mule deer (302 acres) winter range by DFWP (*unpublished interagency map, 2008*). Approximately 355 acres (50.6%) of the project area contains mature, moderately stocked ponderosa pine with some western larch, Douglas-fir, and subalpine fir (≥40% canopy cover, 9 inch dbh average). This habitat consists of moderately stocked forest stands with some pockets of dense canopy cover (70%). Due to the prevalence of poor canopy cover in many portions of the project area, the project area likely provides low quality thermal protection and snow intercept for big game.

The large cumulative effects analysis area contains approximately 35,514 acres (76.2% analysis area) of elk winter range and 8,660 acres (18.6% analysis area) of mule deer winter range (*unpublished interagency map, 2008*). Approximately 3,635 acres (7.8% analysis area) of mature forested habitat (≥40% canopy cover, >9 inch dbh average) exists in the large cumulative effects analysis area and likely provides some thermal protection for big game. However, due to harvesting history in the large cumulative effects analysis area, the availability of mature forested habitat is fairly low; hence, the area likely provides limited effective big game winter range.

ENVIRONMANTAL EFFECTS

Direct and Indirect Effects of the No-Action Alternative on Big Game Winter Range

None of the proposed forest management activities would occur. Mature forested habitat in the project area providing thermal cover in the project area would not be affected. Thus,

since the structure of existing big game winter range would not change, no direct and indirect effects to big game winter range quality would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Big Game Winter Range

Of the 702 acres of elk winter range and 302 acres of mule deer winter range available in the project area, 554 acres (78.9%) of elk winter range and 210 acres (69.5%) of mule deer winter range would be affected by the proposed activities. The proposed activities would reduce canopy cover on 353 acres of mature forested habitat currently providing thermal cover to <40%, reducing the capacity of these areas to provide snow intercept and reduce wind velocity. However, advanced regenerating conifers (>6 feet height) and some canopy cover (10-25%) would be retained, providing some residual cover. If present in the vicinity of the project area, big game could be displaced for up to 3 years. Thus, since: 1) canopy cover would be removed, reducing the quality of big game winter range on 353 acres currently providing thermal cover, 2) some canopy cover and regenerating conifers would be retained, and 3) displacement of big game would be temporary and on a relatively small area (up to 3 years), minor adverse direct and indirect effects to big game winter range quality would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Big Game Winter Range

None of the proposed forest management activities would occur. Big game thermal cover would not be affected, but may change on other ownerships. Thus, since the structure of existing big game winter range would not change, no cumulative effects to big game winter range quality would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Big Game Winter Range

The proposed harvest would reduce canopy cover to <40% within 353 (9.7%) of the 3,645 acres of mature habitat available in the large cumulative effects analysis area. However, advanced regenerating conifers (>6 feet height) and some canopy cover (10-25%) would be retained, providing some thermal cover. Reductions in thermal cover would be additive to any proposed and ongoing activities in the large cumulative effects analysis area, although DNRC is currently unaware of any specific plans. If present in the vicinity of the project area, big game could be displaced for up to 3 years. Thus, since: 1) canopy cover would be removed, reducing the quality of big game winter range on 353 acres currently providing thermal cover, 2) some canopy cover and regenerating conifers would be retained, and 3) displacement of big game would be temporary on a relatively small area (up to 3 years), minor adverse cumulative effects to big game winter range quality would be anticipated as a result of the Action Alternative.

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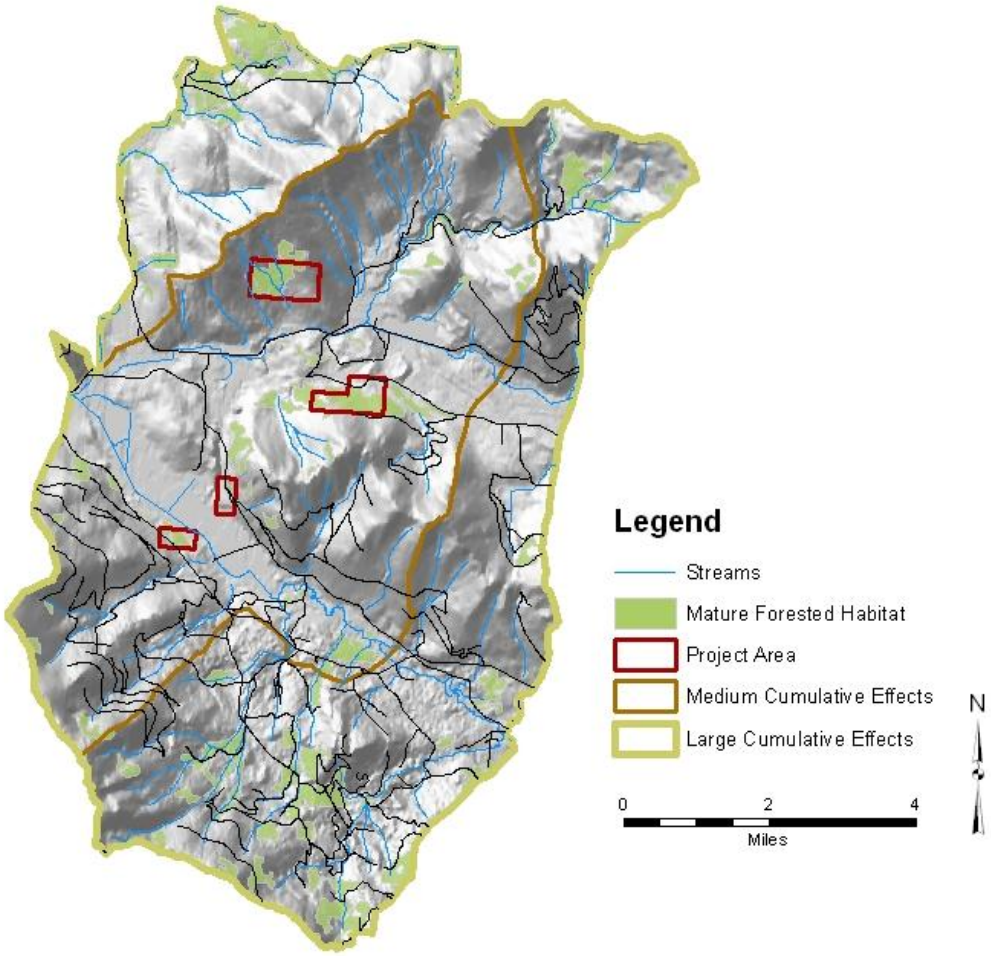
FIGURE W-1 –ANALYSIS AREAS. Wildlife analysis areas for the proposed DNRC Pleasant Valley timber sale.



WATERSHED AND HYDROLOGY ANALYSIS

INTRODUCTION

Project Area and Project Activities

The gross project area includes 720 acres of Trust Lands near Marion, Montana. Affected watersheds include unnamed tributaries to Pleasant Valley Creek and the Pleasant Valley Fisher River. These parcels are within the Pleasant Valley Fisher River watershed, which is a tributary to the Kootenai River. No surface contribution from the proposed project area to the Pleasant Valley Creek or any other water body was identified during field reconnaissance. The project area is adjacent to land managed by the US Fish and Wildlife Service (USFWS), Plum Creek Timber Company (PCTC) and non-industrial private ownership. Proposed project activities would include ground based and cable yarding methods to harvest timber on approximately 553 acres and construction of approximately 0.3 miles of new road within the project area.

Resource Description

Potential risks to water resources include impacts due to increases in water yield and sediment delivery. Water yield increases (WYI) can affect channel stability if dramatically altered, and sediment delivery from both in-channel and introduced sources is a primary component of overall water quality in a watershed.

Issues and Measurement Criteria

The following issues encompass the specific issues and concerns raised through public comment and scoping of the proposed project. For a specific list of individual comments and concerns, please refer to the project file.

Sediment Delivery

Sediment delivery and subsequent water-quality impacts can occur as a result of timber harvesting and related activities, such as road construction and log yarding to landings. Construction of roads, skid trails and landings can generate and transfer substantial amounts of sediment through the removal of vegetation and exposure of bare soil. In addition, removal of vegetation near stream channels reduces the sediment-filtering capacity and may reduce channel stability and the amounts of large woody material. Large woody debris is a very important component of stream dynamics, creating natural sediment traps and energy dissipaters to reduce the velocity and erosive power of stream flows.

Measurement Criteria: Qualitative assessment of road surface drainage Best Management Practices (BMPs), especially near draws. Sediment from harvesting activities and vegetative removal will be analyzed qualitatively through data collected during past statewide and DNRC internal BMP field reviews. Large woody debris in streams will be discussed qualitatively based on findings during field reconnaissance.

Water Yield

Water yield can be affected by timber harvesting and associated activities by affecting the timing, distribution, and amount of water yield in a harvested watershed. Water yields increase proportionately to the percentage of canopy removal (*Haupt 1976*), because removal of live trees reduces the amount of water transpired, leaving more water available for soil saturation and runoff. Water yield is further affected because canopy removal also

decreases interception of rain and snow and alters snowpack distribution and snowmelt. Water yield impacts are ameliorated as new trees begin to grow and use water. New growth also begins to return snowpack distribution to pre-harvest levels as stands grow. Higher water yields may lead to increases in peak flows and peak-flow duration, which can result in accelerated streambank erosion and sediment deposition. Vegetation removal can also reduce peak flows by changing the timing of snowmelt. Openings will melt earlier in the spring with solar radiation and have less snow available in late spring when temperatures are warm. This effect can reduce the synchronization of snowmelt runoff and lower peak flows.

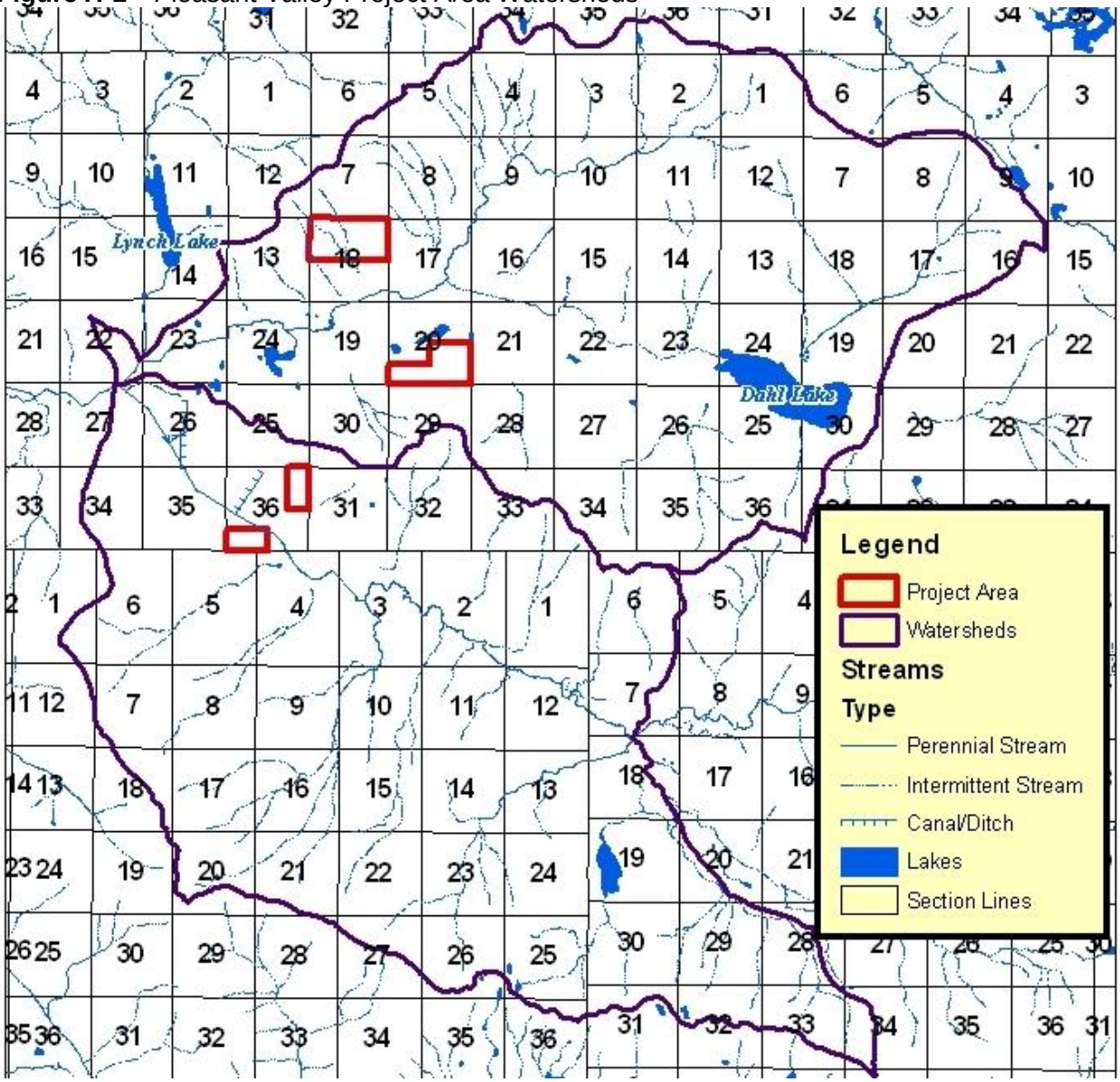
Measurement criteria: Qualitative discussion of potential impacts due to increased water yields in project area draws and streams. Peak flow duration and timing will be addressed qualitatively.

Analysis Area

Sediment Delivery
Analysis area for direct, indirect and cumulative effects to sediment delivery will be analyzed on all existing roads in and leading to the proposed project area. Sediment delivery will be analyzed qualitatively where stream crossings exist within the proposed project area using visual inspection and lineal measurement to determine the road surface area delivering to a stream. Additional sites on proposed haul routes located outside the project area will be assessed qualitatively for their potential to affect downstream water.

Water Yield
Direct, indirect and cumulative effects to water yield will be analyzed in the proposed project area, with a qualitative discussion of potential impacts to the project area watersheds. A map of the project area watersheds and their relation to the proposed project area is found below in ***Figure H-1***. Visual inspection of the runoff patterns and stream channel stability within the Pleasant Valley parcels was used to assess the impacts of past management to water yield. Aerial photo interpretation was used to determine the extent of past management in these watersheds.

Figure H-1 – Pleasant Valley Project Area Watersheds



EXISTING CONDITIONS

Regulatory Framework

Water Quality Standards:

According to the Montana Surface Water Quality Standards found in *ARM 17.30.609* (*1*)(*a*), this portion of the Kootenai River basin, including the Pleasant Valley Fisher River and its tributaries, is classified as B-1. Among other criteria for B-1 waters, no increases are allowed above naturally occurring levels of sediment, and minimal increases over natural turbidity. "Naturally occurring," as defined by *ARM 17.30.602* (*19*), includes conditions or materials present during runoff from developed land where all reasonable land, soil, and water conservation practices (commonly called Best Management Practices or BMPs) have

been applied. Reasonable practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. These practices include, but are not limited to, structural and nonstructural controls and operation and maintenance procedures. Appropriate practices may be applied before, during, or after completion of activities that could create impacts.

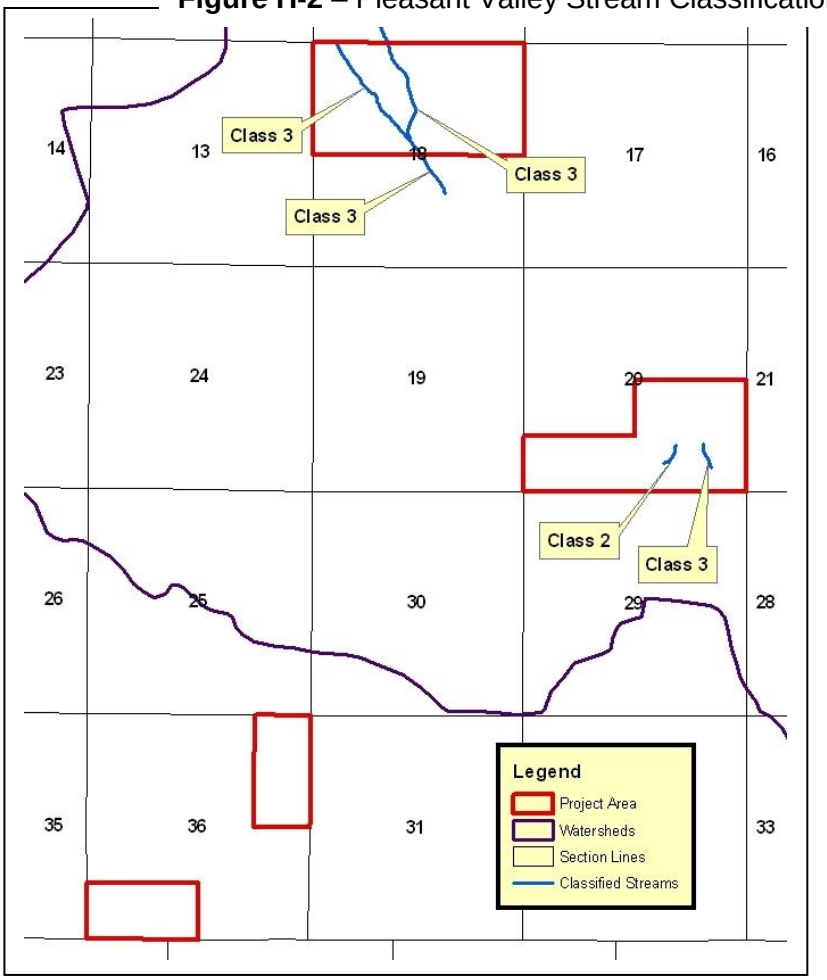
There is one surface water right within the proposed project area for stock watering. One other surface water right for irrigation from a ditch was found approximately 1 mile downstream from the proposed project area.

No beneficial surface water uses were identified within the project area due to a lack of stream channels or lack of delivery to downstream waters.

Water Quality Limited Waterbodies:
No portion of the proposed project area is listed in the 2010 List of Waterbodies in Need of Total Maximum Daily Load (TMDL) Development publication produced by the Montana Department of Environmental Quality (DEQ, 2010).

Montana Streamside Management Zone (SMZ) Law:
For a map of the streams and their SMZ classification, please refer to **Figure H-2**. By the definition in ARM 36.11.312(5), the stream system that drains section 18 of the proposed project is a class 3 stream, since it has a defined channel, flows less than 6 months per year, and does not contribute to any other lake stream or other body of water. By the definition in ARM 36.11.312(4), a small segment of stream in section 20 is a class 2 stream since it flows more than 6 months per year but does not contribute to another lake stream or other body of water. Section 20 also has an intermittent class 3 stream in the western portion of the parcel, as shown in **Figure H-2**. All other drainage features found within the proposed project area did not meet the definition of a stream in ARM 36.11.312(20), and are classified as ephemeral

Figure H-2 – Pleasant Valley Stream Classification



draws and swales with no defined channel.

Sediment Delivery

Section 18 – Sediment delivery on this parcel was reviewed by a DNRC hydrologist in 2011. A class 3 stream system was identified in this section. Upper reaches of this stream system have an 18 inch bankfull width, and in the lower reaches it has approximately a 2-foot bankfull width. The stream has a gravel and coarse sand bottom, and grass and forbs for bank vegetation. Large woody debris was found in adequate supply to support proper channel form and function. No areas of down-cut channels were identified during field reconnaissance.

Two existing sediment delivery sources were found in this parcel from the existing road system. Two existing roads have 18" culverts that have been overtopped. The road fill material has eroded and the pipes are exposed. These sites are a high risk for sediment delivery to the stream during periods of flow. The existing road system in the proposed project area is low to moderate standard native-surfaced road, and has some existing erosion control and surface drainage installed. This road system needs additional surface drainage features, especially near stream crossings, in order to meet applicable best management practices for surface drainage and erosion control. Most road grades are generally under 8%.

Section 20 – Sediment delivery on this parcel was reviewed by a DNRC hydrologist in 2011. A short reach of class 2 and class 3 streams were identified in this parcel. The class 2 stream has an 18-inch bankfull width, and the channel has a coarse sand bottom and has grass vegetation on the banks and in the channel. The class 3 stream has a well-vegetated channel with an approximately 1-foot bankfull width. Large woody debris was found in adequate supply to support proper channel form and function. No areas of down-cut channels were identified during field reconnaissance.

No sediment delivery sources were found in this parcel from the existing road system. The existing road system in the proposed project area is low to moderate standard native-surfaced road, and has some existing erosion control and surface drainage installed. This road system needs additional surface drainage features, especially near stream crossings, in order to meet applicable best management practices for surface drainage and erosion control. Most road grades are generally under 8%.

Section 36 – Sediment delivery on this parcel was reviewed by a DNRC hydrologist in 2011. No stream channels were identified in any of the section 36 parcels. The southwest parcel has two moist meadows, but these did not have any features that meet the definition of a stream. None of these features had areas of down-cutting or scour identified during field reconnaissance.

No sediment delivery sources were found in this parcel from the existing road system. The existing road system in the proposed project area is low to moderate standard native-surfaced road, and has some existing erosion control and surface drainage installed. This road system needs additional surface drainage features, especially near stream crossings, in order to meet applicable best management practices for surface drainage and erosion control. Most road grades are generally under 8%.

Water Yield
Water yield in the proposed project area will be assessed qualitatively per *ARM 36.11.423.* Due to a lack of connectivity to downstream water and beneficial uses in section 18 and section 20, and a lack of stream channels within section 36 of the project area, a qualitative assessment is deemed adequate to ensure compliance with all water-quality standards, protect beneficial uses, and exhibit a low degree of risk.

Water yield increases can result from past activities in and around the proposed project area, which include timber management and agriculture. These activities have led to reductions in forest canopy cover, and construction of roads.

Evidence of water yield increases was not found during field reconnaissance of the proposed project area. As a result, it was determined that a detailed water yield analysis would not be necessary for the proposed project area. All defined stream channel in the proposed project area appear to have stable flows with no evidence of instability from water yield increases, and very little scouring effect from annual runoff events. None of the broad ephemeral draws within the proposed project area have any evidence of overland flow (channel scour, re-alignment of litter, definable banks). As a result, water yield and peak flow increases resulting from past activities have not been sufficient to destabilize stream channels, or to scour a channel in any of the broad draws throughout the project area.

Fish Habitat
Due to the ephemeral flows found in project area stream channels, a lack of surface connection of the streams to downstream waters, and data from Montana Fish, Wildlife and Parks showing no fish present near the project area, fish habitat will not be analyzed for this project.

DIRECT AND INDIRECT EFFECTS

No Action Alternative
Direct and indirect effects of the No Action alternative would be similar to the conditions described under the existing conditions for sediment delivery and water yield. The sediment delivery and water yield would be unaffected by the no action alternative, and streams and ephemeral draws in the proposed project area would continue to be affected by natural and pre-existing conditions.

Action Alternative
The proposed action alternative would harvest timber from approximately 553 acres. The following are the anticipated direct and indirect impacts:

Sediment Delivery
Sediment delivery risk from the existing and proposed road system is expected to be low. The action alternative would improve and maintain erosion control and surface drainage on all roads proposed for haul. The action alternative proposes to construct approximately 0.3 miles of new road. No new stream crossings would be constructed on the proposed new road. One of the washed out stream crossings in section 18 of the proposed project area would be rehabilitated and re-vegetated, the other would be replaced with a new crossing that would meet all applicable BMPs. Short-term risk of low levels of erosion and deposition would be increased for approximately 2 to 3 years after completion due to exposure of bare soil during construction, surface drainage improvement and hauling activities. This risk would return to near current levels as road surfaces re-vegetate, and

may be reduced due to improved erosion control and surface drainage. Overall, there is a low to moderate risk of short-term low-level increase in erosion and sediment delivery for about 2-3 years at the new and existing stream crossings. However, water quality standards are expected to be met and there is a low risk of impacts to downstream beneficial uses.

Sediment delivery risk form the proposed timber harvesting is expected to be low. Most of the proposed timber harvesting activities would pose a low risk of sediment delivery to streams since none of the proposed harvesting would occur within a SMZ. The SMZ law, Administrative Rules for Forest Management, and applicable BMPs would be applied to all harvesting activities, which would minimize the risk of sediment delivery to draws and streams. The Montana BMP audit process has been used to evaluate the application and effectiveness of forest-management BMPs since 1990; this process has also been used to evaluate the application and effectiveness of the SMZ Law since 1996. During that time, evaluation of ground-based-skidding practices near riparian areas has been rated 92-percent effective, and these same practices have been found effective over 99 percent of the time from 1998 to present (*DNRC 1990 through 2010*). Since 1996, effectiveness of the SMZ width has been rated over 99 percent (*DNRC 1990 through 2010*). As a result, with the application of BMPs and the SMZ Law, proposed activities are expected to have a low to moderate risk of low impacts to sediment delivery.

Water Yield

Water yield increases and associated risks of destabilizing channels from the proposed action alternative are expected to be low and not measurable. The proposed action alternative would harvest timber from approximately 553 acres. No measurable impacts to stream channel stability from water yield or peak flow increases are anticipated from the proposed harvesting for the following reasons: 1) The well-drained to excessively well-drained nature of the soils would absorb additional on-site moisture and not produce increased surface runoff, and would in turn produce little or no detectable change in water yield from upland sites, 2) The ephemeral draws within the project area are stable and vegetated with a dense mat of grass and forbs vegetation, making them capable of handling potential water yield increases without destabilizing, and 3) The stability of channels where they exist would be sufficient to handle potential increases. It is not expected that possible increases in water yield would create surface flow to any other body of water beyond that occurring under the existing conditions.

CUMULATIVE EFFECTS

No Action Alternative

Cumulative effects of the No Action alternative on sediment delivery and water yield would be similar to the situations described in the existing conditions. The sediment delivery and water yield would be unaffected by the No Action alternative, and the streams and ephemeral draws in the proposed project area would continue to be affected by natural and pre-existing conditions.

Action Alternative

Cumulative effects of past activity in and around the proposed project area has been driven mainly by timber management. On sites where timber was harvested, there has been substantial vegetative and hydrologic recovery with no apparent impact on water yield

increases. The anticipated cumulative effects of the proposed action alternative are summarized below.

Sediment Delivery
Risk of sediment delivery and sediment loading to waters downstream from the proposed project area would be slightly increased from current levels in the short term and similar to or below current levels in the long term. Maintenance and improvement of existing erosion control and surface drainage on the existing road system would yield similar erosion rates to current levels and maintain a similar or lower risk of sediment delivery to other areas. New road construction would implement all applicable BMPs, so risks of sediment delivery would be increased for 2-3 years after construction, but would decrease to levels similar to the existing road system once bare soil is vegetated. Implementation of all applicable rules associated with the SMZ Law and timber harvest BMPs, there would be a low risk of cumulative effects to sediment delivery from timber harvesting proposed with the action alternative. Overall, there is a low to moderate risk of short-term low-level increases in sediment loading for about 2-3 years. However, water quality standards are expected to be met and there is a low risk of impacts to beneficial uses.

Water Yield
Cumulative effects to water yield from past activity in and around the proposed project area have mainly consisted of timber management dating back to the 1950s, and as recently as the 1980s. On sites where timber was harvested, there has been substantial vegetative and hydrologic recovery with no apparent impact to stream channels or draws from water yield or peak flow increases.

Cumulative effects to water yield are not anticipated for the following reasons: 1) The well-drained to excessively well-drained nature of the soils would absorb additional on-site moisture and not produce increased surface runoff, and would in turn produce little or no detectable change in water yield from upland sites, 2) The ephemeral draws within the project area are stable and vegetated with a dense mat of grass and forbs vegetation, making them capable of handling potential water yield increases without destabilizing from a combination of past and proposed activities, and 3) All of the proposed harvesting would occur in ephemeral draws with no surface delivery to another body of water. As a result, there would be a low risk of the action alternative, when combined with past and current vegetative changes, leading to water yield increases destabilizing channels beyond the current conditions.

SOILS ANALYSIS

INTRODUCTION

Landform Description

The landform and parent materials in the project area are generally glacial till derived from quartzite and argillite, with small areas of lacustrine deposits and soils formed from weathered bedrock. The majority of the bedrock consists of slightly metamorphosed sedimentary rocks formed from sand, silt, clay, and carbonate materials deposited in an ancient shallow sea during the Precambrian period.

Issues and Measurement Criteria

The following issues encompass the specific issues and concerns raised through public comment and scoping of the proposed project. For a specific list of individual comments and concerns, please refer to the project file.

Soil Physical Properties

Analysis of soil physical properties addresses the issue that timber harvesting and associated activities may affect soil conditions in the proposed project area through ground-based activities, and through repeated entries to previously harvested areas. Operation of ground-based machinery can displace fertile layers of topsoil, which can lead to a decrease in vegetation growth. Ground-based machinery can also lead to compaction of the upper layers of soil. Compaction decreases pore space in soil, reduces its ability to absorb and retain water, and can increase runoff and overland flow. These conditions can also lead to a decrease in vegetation growth.

Slope Stability

Slope stability can be affected by timber management activities by removing stabilizing vegetation, concentrating runoff, or by increasing the soil moisture. The primary risk areas for slope stability problems include, but are not limited to, landtypes that are prone to soil mass movement, and soils on steep slopes (generally over 60 percent).

Analysis Methods

Soil Physical Properties

Impacts to soil physical properties will be analyzed by evaluating the current levels of soil disturbance in the proposed project area based on field review and aerial photo review of existing and proposed harvest units. Percent of area affected is determined through pace transects, measurement, aerial photo interpretation, or GIS to determine skid trail spacing and skid trail width. From this, skid trail density and percent of area impacted are determined. Estimated effects of proposed activities will be assessed based on findings of DNRC soil Monitoring.

Slope Stability

Slope stability risk factors will be analyzed by reviewing the Web Soil Survey (NRCS, 1996) and the Soil Survey of Flathead County Area and Part of Lincoln County, Montana (USDA, 2010) to identify map units listed as high risk for mass movement. Field reconnaissance will also be used to identify any slopes greater than 60 percent as an elevated risk for mass movement.

Analysis Area

The analysis area for evaluating soil physical properties and slope stability will include DNRC owned land within the Pleasant Valley project area parcels. A map of the soil map units in the Pleasant Valley project area is found below in **Figure S-1** and **Figure S-2**.

Figure S-1 – Map of Pleasant Valley Soil Map Units, Sections 18 & 20

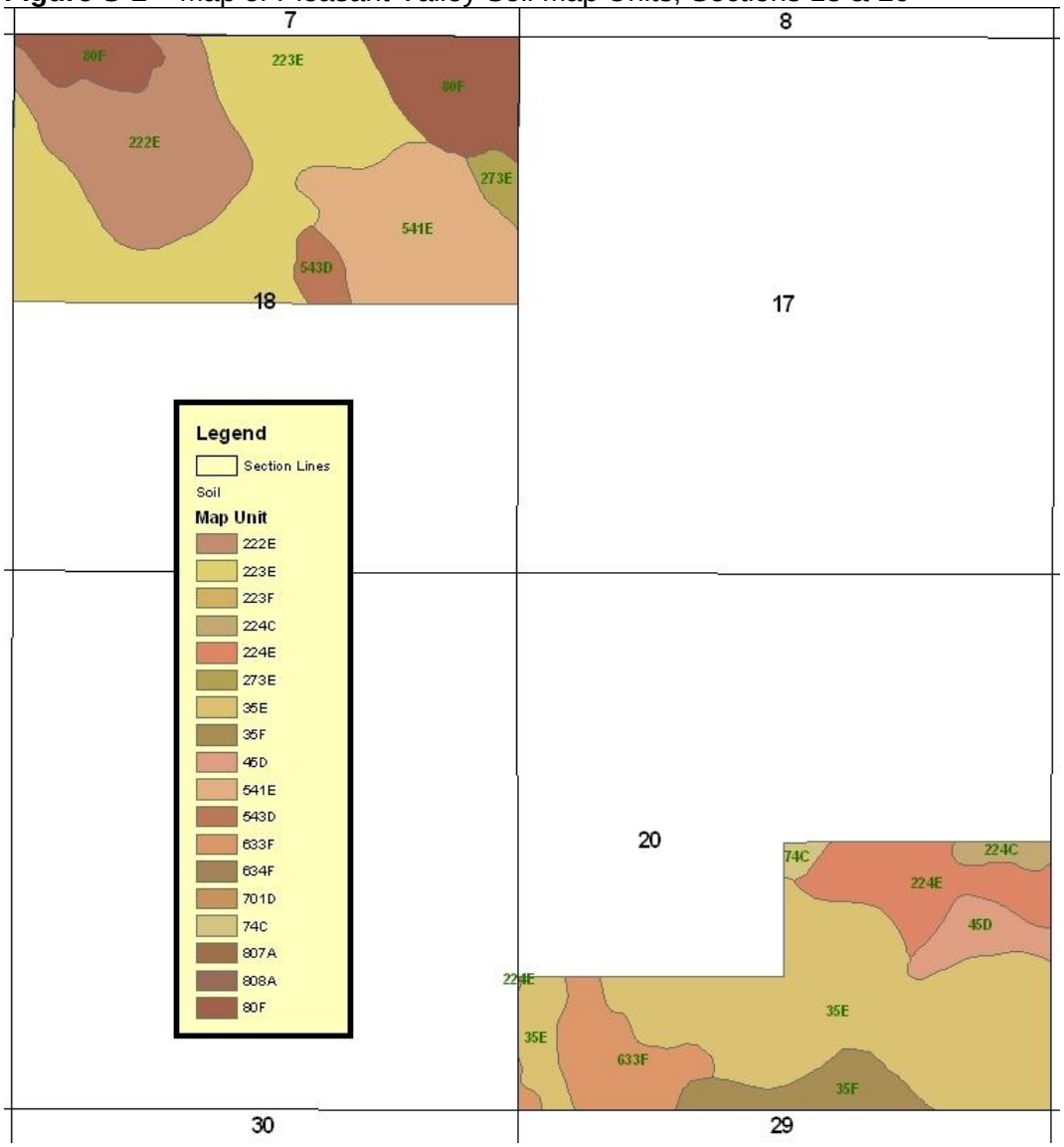
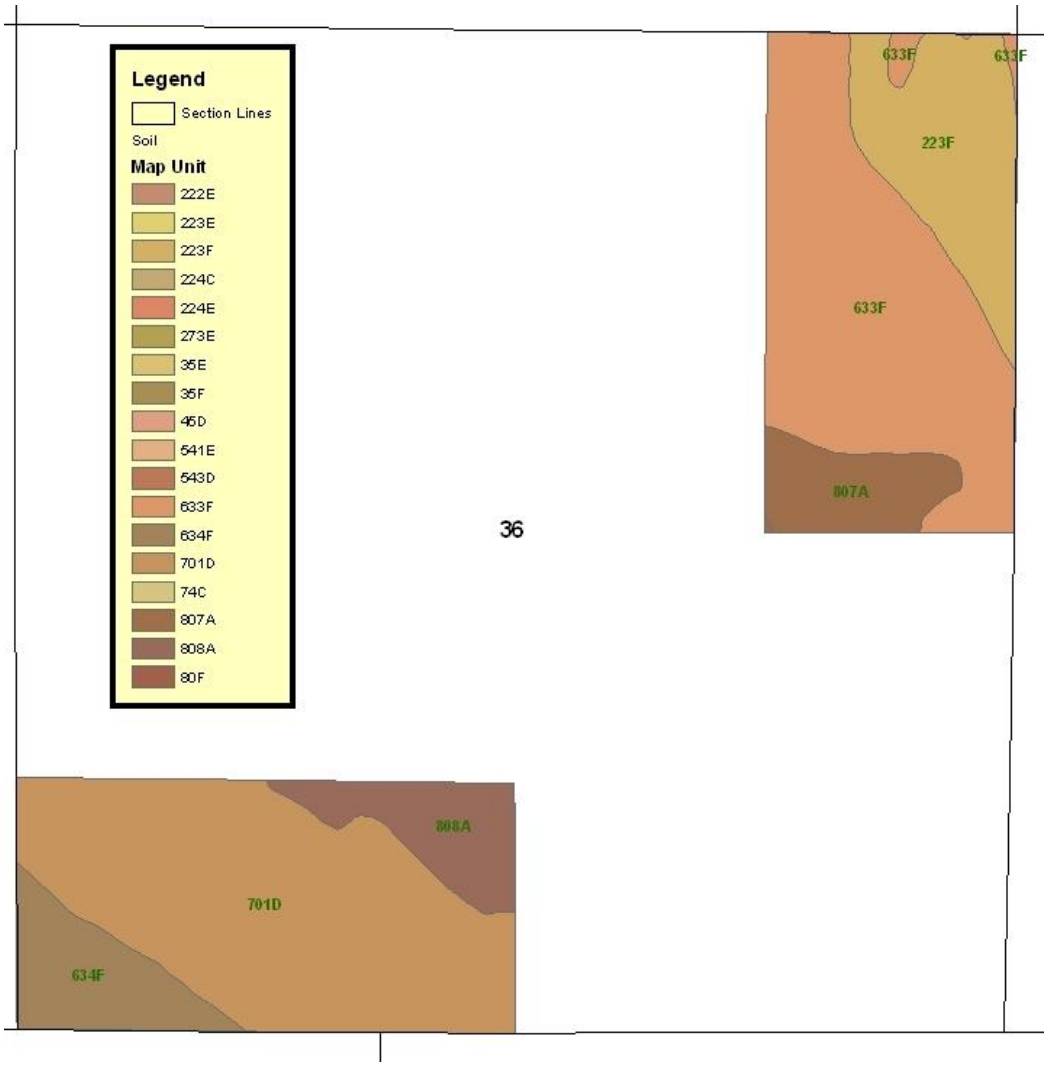


Figure S-2 – Map of Pleasant Valley Soil Map Units, Section 36



EXISTING CONDITIONS

Soil Physical Properties

Existing conditions of soil physical properties were assessed in the proposed project area by a DNRC watershed specialist in 2011. The DNRC has conducted timber harvesting in the proposed project area since the 1950s. Timber sale records dating back to the 1950s indicate most of the proposed project area has been harvested using primarily ground-based yarding methods. Ground-based yarding can create soil impacts through displacement and compaction of productive surface layers of soil, mainly on heavily used trails. Existing skid trails on project area parcels are spaced at between 75 and 120 feet apart, with an average spacing of approximately 95 feet. None of these existing skid trails were identified as erosion or sediment sources. Trails are still apparent, but most are well vegetated and past impacts are beginning to ameliorate from freeze-thaw cycles and root penetration. Based on pace transects of trail spacing, knife penetration tests for compaction, and ocular estimates of re-vegetation, less than 10% of previously ground-skidded harvest units are in an impacted condition in the proposed project area.

Slope Stability

Slope stability was assessed through field review of the project area. Soil types in the project area are found primarily on gentle to moderate (0-40%) slopes found on hilly terrain, although short pitches steeper than 40% are found in isolated areas. The Web Soil Survey (NRCS, 1996) and the Soil Survey of Flathead County Area and Part of Lincoln County, Montana (USDA, 2010) identified no areas of soils at high risk for mass movements in the project area. No slope failures were identified during reconnaissance in the proposed project area. Because none of the slope stability risk factors are present in the proposed project area, slope stability will not be evaluated on this project in the remainder of this analysis. A list of soil types found in the Pleasant Valley project area and their associated management implications is found in **Table S-2**.

DIRECT AND INDIRECT EFFECTS

No Action Alternative

The No Action Alternative would have no direct or indirect effects on soil physical properties. No ground-based activity would take place under this alternative, which would leave the soil in the project area unchanged from the description in the Existing Conditions portion of this analysis.

Action Alternative

Soil Physical Properties

Direct and indirect effects of the proposed action alternative to soil physical properties were based on DNRC soil monitoring on soils and sites similar to those found in the project area. Based on past monitoring, direct impacts to soil physical properties would be expected on up to 74 of the total 553 acres proposed for harvesting in the Pleasant Valley project area. Soil monitoring conducted on DNRC lands shows that sites harvested on DNRC lands statewide on similar soils with ground-based machinery had a range of impacts from 1.0 to 34.1 percent of the acres treated, with an average disturbance rate of 13.2% (DNRC, 2011). The low range of impacts includes operations on frozen or snow-covered soils, and the high range includes operations on steep slopes during non-winter conditions. As a result, the extent of impacts expected on ground-based harvesting would likely be similar to those reported by Schmalenberg (DNRC, 2011), or approximately 1.0 to 34.1 percent of ground-based harvested acres. All 553 harvest acres in the proposal would be yarded with ground-based mechanical harvesting.

Direct impacts to the soil physical properties would also be generated by ground-based site preparation. Site-preparation disturbance would be intentionally done, and these impacts are considered light and promote reforestation of the site. The expected impacts to the soil resource as a result of the Action Alternative are summarized in ***Table S-1***. These activities, including road construction and ground based yarding, would leave approximately 13.4 percent of the proposed harvest units in an impacted condition. This level is below the range analyzed for in the *EXPECTED FUTURE CONDITIONS* section of the *SFLMP*, and well within the 20-percent impacted area established as a level of concern in the *SFLMP (DNRC 1996)*. In addition, BMPs and a combination of mitigation measures would be implemented to limit the area and degree of soil impacts as noted in ARM 36.11.422 and the SFLMP (DNRC, 1996).

Table S-1 – Summary of Direct Effects of Alternatives on Soils

Description of Parameter	No Action	Action Alternative
Acres of Harvest	0	553
Acres of ground based yarding	0	553
Acres of ground based impacts[1]	0	**73**
Miles of new roads	0	0.3
Acres of new roads[2]	0	**1**
Total estimated acres of impacts	0	**74**
Percent of harvest area with impacts	0%	13.4%

[1] 13.2% of tractor units based on average impacts found on similar soils and sites by DNRC soil monitoring
[2] Assuming an average width of 25 feet, roads are approximately 3 acres per mile

CUMULATIVE EFFECTS

No Action

Soil Physical Properties

This alternative would have no cumulative impacts to soil physical properties in the project area. The impacts of this alternative would be similar to those described in the Existing Conditions portion of this analysis. No soil would be disturbed and no re-entry of past harvest units would occur. All impacts from past management activities would continue to improve or degrade as dictated by natural and pre-existing conditions.

Action Alternative

Soil Physical Properties

Cumulative effects to soil physical properties may occur from repeated entries into a forest stand where additional ground is impacted by equipment operations. With this alternative, all 553 acres proposed for harvesting have had previous timber sale operations. Existing skid trails where compaction has begun to ameliorate through freeze-thaw cycles and re-vegetation would return to a higher level of impact due to the Action Alternative. Additional trails may also be required if existing trails are in undesirable locations. Cumulative impacts to soil physical properties under the Action Alternative are still expected to remain below the range analyzed for in the EXPECTED FUTURE CONDITIONS section of the SFLMP and remain well within the 20-percent impacted area established as a level of concern in the SFLMP (DNRC, 1996).

DNRC would minimize long-term soil impacts and adverse cumulative effects by implementing any or all of the following: 1) existing skid trails from past harvest activities would be used if they are properly located and spaced 2) additional skid trails would be used only where existing trails are unacceptable 3) mitigating the potential direct and indirect effects with soil moisture restrictions, season of operation, and method of harvest 4) retention of a portion of coarse woody debris and fine litter for nutrient cycling.

Table S-2 – Soil Map Unit Descriptions for the Pleasant Valley Project Area

Map Unit	Name	Soil & Vegetation Descriptions	Management Considerations			
			K_w**/erosion potential*	Timber	Roads	Comments
35E 35F	Courville-Pleasantvalley complex E: 8 - 30% slopes F: 30-50% slopes	Soils of this map unit have been formed from volcanic ash over till derived from quartzite. Vegetation is Douglas-fir over an understory of shrubs.	K_w – 0.10-0.32 Erosion risk is low to moderate	Potential Prod: High Equipment: Tractor/cable Regen: Good	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	
45D	Waldbillig gravelly ashy silt loam 4-15% slopes	Soils of this map unit have been formed from volcanic ash over till derived from quartzite. Vegetation is subalpine fir over an understory of shrubs and forbs.	K_w – 0.10-0.20 Erosion risk is low	Potential Prod: Mod/high Equipment: Tractor Regen: Good	Roads perform well with standard location, construction and maintenance practices.	
74C	Blackcreek-McGregor-Tallcreek complex 0-8% slopes	Soils of this map unit have been formed from volcanic ash over alluvium and/or lacustrine deposits. Vegetation is non-forested meadow.	K_w – 0.15-0.64 Erosion risk is moderate	Potential Prod: High Equipment: Tractor Regen: Good	Roads perform well with standard location, construction and maintenance practices.	Watch season of use for rutting and compaction
80F	Sharrott-Rock outcrop-Winkler complex 15-60% slopes	Soils of this map unit have been formed from colluvium over residuum weathered from quartzite and/or argillite. Vegetation is Douglas-fir over an understory of grass.	K_w – 0.05-0.20 Erosion risk is low	Potential Prod: Low/Mod. Equipment: Tractor/cable Regen: May be affected by moisture stress	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	
222E	Pleasantvalley-Winfall, dry complex 8-30% slopes	Soils of this map unit have been formed from volcanic ash over till derived from quartzite. Vegetation is Douglas-fir over an understory of shrubs and forbs.	K_w – 0.15-0.28 Erosion risk is low to moderate	Potential Prod: Mod/high Equipment: Tractor Regen: Good	Roads perform well with standard location, construction and maintenance practices.	
223E 223F	Pleasantvalley-Winfall, dry-Rock outcrop complex E: 8-30% slopes F: 30-50% slopes	Soils of this map unit have been formed from volcanic ash over till derived from quartzite. Vegetation is Douglas-fir over an understory of shrubs.	K_w – 0.15-0.28 Erosion risk is low to moderate	Potential Prod: Mod/high Equipment: Tractor/cable Regen: Good	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	
224C 224E	Pleasantvalley-Finleypoint-Lynchlake, dry complex E: 2-8% slopes F: 8-30% slopes	Soils of this map unit have been formed from volcanic ash over till derived from quartzite. Vegetation is Douglas-fir over an understory of shrubs.	K_w – 0.15-0.55 Erosion risk is moderate	Potential Prod: Moderate Equipment: Tractor Regen: Good	Roads perform well with standard location, construction and maintenance practices.	Stoniness may create drivability problems
273E	Wildgen-Finleypoint-Combest complex 8-30% slopes	Soils of this map unit have been formed from glacial till. Vegetation is Douglas-fir over an understory of shrubs and forbs.	K_w – 0.05-0.24 Erosion risk is low to moderate	Potential Prod: Mod/high Equipment: Tractor Regen: May be affected by moisture stress	Roads perform well with standard location, construction and maintenance practices.	
541E	Finleypoint-Haskillpass-Wimper complex 8-30% slopes	Soils of this map unit have been formed from till derived from quartzite. Vegetation is Douglas-fir over an understory of grasses.	K_w – 0.15-0.28 Erosion risk is low to moderate	Potential Prod: High Equipment: Tractor Regen: May be affected by moisture stress	Roads perform well with standard location, construction and maintenance practices.	
543D	Finleypoint-Wimper complex 4-15% slopes	Soils of this map unit have been formed from till derived from quartzite. Vegetation is Douglas-fir over an understory of grasses.	K_w – 0.15-0.24 Erosion risk is low to moderate	Potential Prod: Moderate Equipment: Tractor Regen: Good	Roads perform well with standard location, construction and maintenance practices.	Stoniness may create drivability problems
633F	Rockhill-Rock outcrop-Pleasantvalley complex 4-15% slopes	Soils of this map unit have been formed from volcanic ash over colluvium derived from quartzite. Vegetation is Douglas-fir over an understory of grasses and forbs.	K_w – 0.15-0.28 Erosion risk is low to moderate	Potential Prod: Low/Mod. Equipment: Tractor Regen: Good	Roads perform well with standard location, construction and maintenance practices.	Rock outcropping may affect road location/design.
634F	Rockhill-Rock outcrop-Courville complex 15-50% slopes	Soils of this map unit have been formed from volcanic ash over colluvium derived from quartzite. Vegetation is Douglas-fir over an understory of grasses and forbs.	K_w – 0.10-0.28 Erosion risk is low to moderate	Potential Prod: Moderate Equipment: Tractor/cable Regen: Good	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	
701D	Half Moon, cool-Lynchlake complex 4-15% slopes	Soils of this map unit have been formed from glaciolacustrine deposits. Vegetation is grand fir over an understory of forbs.	K_w – 0.43-0.55 Erosion risk is moderate to high	Potential Prod: High Equipment: Tractor Regen: Good	Roads perform well with standard location, construction and maintenance practices.	Watch season of use for rutting and compaction

Map Unit	Name	Soil & Vegetation Descriptions	Management Considerations			
			K_w/erosion potential***	**Timber**	**Roads**	**Comments**
807A	McLangor-Barzee mucky peats 0-2% slopes	Soils of this map unit have been formed from organic material over alluvium. Vegetation is non-forested wet meadow.	K_w – 0..49-0..55 Erosion risk is moderate to high	Potential Prod: Non-forest Equipment: Poorly suited Regen: May be affected by high water table	Low bearing strength and high water table make road construction infeasible/expensive.	
808A	Barzee mucky peat 0-1% slopes	Soils of this map unit are organic deposits Vegetation is non-forested wet meadow.	K_w – N/A Erosion risk is not rated	Potential Prod: Non-forest Equipment: Poorly suited Regen: May be affected by high water table	Low bearing strength and high water table make road construction infeasible/expensive.	

* Erosion Potential is based on slope and soil erosion factor K**. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 70 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight (low), moderate, severe, or very severe. A rating of slight indicates that erosion is unlikely under ordinary climatic conditions; moderate indicates that some erosion is likely and that erosion-control measures may be needed; severe indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and very severe indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion–control measures are costly and generally impractical. (NRCS, 1996)

**Erosion Factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. (NRCS, 1996)

REFERENCES:

USDA-NRCS, 2010. Soil Survey of Flathead County Area and Part of Lincoln County, Montana. Accessible online at http://soils.usda.gov/survey/printed_surveys

Attachment III

Prescriptions

Pleasant Valley Timber Sale Harvest Unit Prescriptions

Harvest Unit: 18-1 **Harvest Unit Acres:** 210 Acres

Elevation: 3620ft-4200ft **Slope:** 0%-45% **Aspect:** E to S to SW

Habitat Type: PSME/LIBO-SYAL, PSME/LIBO-CARU, PSME/SYAL-CARU, PSME/CARU-PIPO

Current Cover Type: Ponderosa Pine, Western Larch/Douglas-fir

Desired Future Condition: Ponderosa Pine, Douglas-fir/Western Larch

Soil Type: Gravelly Loam, Gravelly Ashy Loam

Location: N ½ Section 18, Township 28N, Range 26W

Harvest Unit: 20-1 **Harvest Unit Acres:** 222 Acres

Elevation: 3580ft-4040ft **Slope:** 0%-45% **Aspect:** NW to N

Habitat Type: PSME/FESC, PSME/VACA, PICEA/VACA, ALBA/VACA

Current Cover Type: Sub-alpine Fir, Western Larch/Douglas-fir, Ponderosa Pine

Desired Future Condition: Western Larch/Douglas-fir, Ponderosa Pine

Soil Type: Gravely Ashy Silt Loam

Location: S ½ Section 20, Township 28N, Range 26W

Harvest Unit: 36-1 **Harvest Unit Acres:** 37 Acres

Elevation: 3560ft-3740ft **Slope:** 0%-35% **Aspect:** SW

Habitat Type: PSME/VACA

Current Cover Type: Western Larch/Douglas-fir, Ponderosa Pine

Desired Future Condition: Ponderosa Pine

Soil Type: Gravely Ashy Silt Loam

Location: E ½ NE ¼ Section 36, Township 28N, Range 27W

Harvest Unit: 36-2 **Harvest Unit Acres:** 21 Acres

Elevation: 3500ft-3560ft **Slope:** 0%-10% **Aspect:** SW

Habitat Type: PSME/CARU-ARUV

Current Cover Type: Ponderosa Pine

Desired Future Condition: Ponderosa Pine

Soil Type: Gravely Ashy Silt Loam

Location: E ½ NE¼ Section 36, Township 28N, Range 27W

Harvest Unit: 36-3 **Harvest Unit Acres:** 64 Acres

Elevation: 3500ft-3680ft **Slope:** 0%-35% **Aspect:** NE

Habitat Type: PICEA/VACA, ABLA/VACA

Current Cover Type: Western Larch/Douglas-fir, Sub-alpine Fir, Mixed Conifer

Desired Future Condition: Western Larch/Douglas-fir

Soil Type: Gravely Ashy Silt Loam, Silt Loam

Location: S ½ SW ¼ Section 36, Township 28N, Range 27W

Description of Existing Stand:

The three sections that harvest will occur are located in the Pleasant Valley area approximately 35 air miles west of Kalispell. Units 18-1 and 20-1 are adjacent to the Lost Trail Wildlife Refuge (LTWR). All three sections were previously logged. The first harvest occurred from 1950-1952. This harvest removed 7MMBF off of the three sections by cutting the majority of the overstory. The second entry was in 1980-1981. This harvest removed 1.2MMBF off of the same three sections. The prescription for that sale was to remove all of the beetle attacked pine, remove the remaining old seed trees from the previous harvest, and commercially thin the middle story.

Unit 18-1 is bordered by Plum Creek Timber land on the north side and LTWR land on the east, south, and west sides. The unit is comprised of seven different stands identified in the Stand Level Inventory. The stand age is about 90 years old. The stand is comprised of an uneven aged mix of Douglas-fir, ponderosa pine, and western larch due to previous harvests. A shelterwood/commercial thin prescription will be implemented in this unit. The stand has 93 ft^2 basal area per acre. The average height is 64ft tall and average diameter breast height is 13 in.

Unit 20-1 is bordered by Plum Creek Timber land on the south side and LTWR land on the east, north, and west sides. The unit is comprised of nine different stands identified in the Stand Level Inventory. The stand age is about 90 years old. The overstory is dominated by western larch and Douglas-fir with some ponderosa pine on the west facing slope. The mid-story and understory are

dominated by the more shade tolerant Douglas-fir with some true firs and lodgepole pine regeneration. A shelterwood/commercial thin prescription will be implemented in this unit. The stand has 87 ft^2 basal area per acre. The average height is 67ft tall and average diameter breast height is 12 in.

Unit 36-1 is bordered by Plum Creek Timber land on the north and east sides. The unit is comprised of four different stands identified in the Stand Level Inventory. The stand age is about 100 years old. The overstory is dominated by ponderosa pine with a few western larch scattered in pockets. The mid story is comprised of 9-10 inch ponderosa pine with a 10 acre patch of younger larch. Most of the over story will be removed and the mid-story trees will be commercially thinned. The stand has 70 ft^2 basal area per acre. The average height is 75ft tall and average diameter breast height is 14 in.

Unit 36-2 is bordered by Plum Creek Timber land on the southeast corner and private property surrounding the rest. The unit is comprised of two different stands identified in the Stand Level Inventory. The stand age is about 120 years old. The stand is comprised of large overstory ponderosa pine growing in scattered patches. There is little ponderosa pine regeneration established in this unit. A seed tree prescription will be implemented. The stand has 68 ft^2 basal area per acre. The average height is 80ft tall and average diameter breast height is 14 in.

Unit 36-3 is bordered by Plum Creek Timber land on the southwest corner and private property surrounding the rest. The unit is comprised of five different stands identified in the Stand Level Inventory. The stand age is about 90 years old. The overstory is dominated by western larch and Douglas-fir. The mid-story and understory are dominated by the more shade tolerant Douglas-fir with some true firs and lodgepole pine regeneration. A shelterwood/commercial thin prescription will be implemented in this unit. The stand has 124 ft^2 basal area per acre. The average height is 68ft tall and average diameter breast height is 12 in.

Treatment Objectives:

- Remove unhealthy, diseased and insect infested trees, as well as those with poor vigor, from the overstory to promote long-term forest health.
- Thin intermediate and understory components of stand to enhance growth characteristics and reduce fuel loading.
- Create a disturbance to promote natural ponderosa pine and western larch regeneration.
- Retain large diameter, decadent ponderosa pine and western larch for shading, cover and snag replacement.
- Protect soil productivity by minimizing soil displacement, compaction, and erosion during logging and road building operations.
- Retain logging slash for woody debris recruitment and nutrient cycling of foliage and fine fuels to maintain site productivity.

Prescribed Treatment:

- Modified shelterwood/seed-tree, commercial thin, and overstory removal harvest prescriptions will be used leaving healthy, vigorous trees with good crown and bark characteristics.
- Favor leaving dominant and co-dominant ponderosa pine, western larch and Douglas-fir while removing all merchantable grand fir, Engelmann spruce, sub-alpine fir and lodgepole pine.
- In Units 18-1, 20-1, and 36-3 spacing for leave trees will be about 35ft. to 50ft. leaving 36 to 17 trees per acre.
- In Unit 36-1 average spacing will be about 20ft leaving approximately 100 trees per acre.
- In Unit 36-2 average spacing will be about 65ft leaving approximately 10 trees per acre.

- Retain at least two snags per acres >16” DBH and two snag recruits per acre to remain standing if they are not a safety hazard.

Harvest Method:

- Tractor logging with conventional, mechanical, or cut-to-length operations are applicable to this unit.
- Ponderosa pine, western larch and Douglas-fir will be marked to leave.

Hazard Reduction:

- Pile and burn slash at landings following harvest if grinding slash is not feasible.
- Slash would be lopped and /or trampled to a depth of 24” or less.
- Machine pile and burn all slash in excess of retention requirements of 5 to 10 tons per acre.
- All slash piles will be burned by the State.
- The purchaser will be required to meet hazard reduction standards as applied under the State Fire Hazard Reduction Law (76-13-403 MCA).

Regeneration/Site Preparation:

- Monitor success of natural regeneration and plant seedlings if necessary.
- Precommercially thin healthy regeneration to promote future growth and vigor if funding allows.
- Slashing of advanced shade tolerant regeneration and site preparation to encourage seral regeneration will be used in areas without adequate stocking.

Anticipated Future Treatments:

- Stand conditions would be monitored for future salvage opportunities related to insect and disease outbreaks, severe weather events, fire or other unanticipated circumstances on a case-by-case basis.
- This stand would be evaluated for regeneration, planting needs and possible precommercial thinning opportunities as the stand progresses in age.

Attachment IV

Mitigations

Vegetation Mitigations:

- To minimize the potential for the spread of noxious weed, off-road equipment would be cleaned and inspected as required in the timber sale contract to avoid seed migration.

- If any sensitive plant species are observed within the project area, a equipment restriction zone will be made around the specimen and a plant survey will be completed.

Wildlife Mitigations:

- If a threatened or endangered species is encountered, consult a DNRC biologist and develop additional mitigations that are consistent with the administrative rules for managing threatened and endangered species (*ARM 36.11.428* through *36.11.435*).

- Prohibit contractors and purchasers conducting contract operations from carrying firearms while on duty as per GB-PR2 (*DNRC HCP FEIS Vol. II p. 2-5*).

- Contractors will adhere to food storage and sanitation requirements as per GB-PR3 (*DNRC HCP FEIS Vol. II p. 2-6*).

- Restrict commercial harvest and motorized activities on restricted roads to reduce disturbance to grizzly bears from April 1-June 15 within Section 18 T28N, R26W (*GB-NR3, DNRC HCP FEIS Vol. II pp. 2-11, 2-12*).

- Within Canada lynx winter foraging habitat, retain up to 10% of the stand area in patches of advanced regeneration of shade-tolerant trees (grand fir, subalpine fir, and spruce) as per LY-HB4 (*DNRC HCP FEIS Vol. II pp. 2-50, 2-51*).

- Manage for snags, snag recruits, and coarse woody debris, particularly favoring ponderosa pine, western larch and Douglas-fir. Emphasize the retention of downed logs ≥15 inches dbh where they occur as per LY-HB2 (*DNRC HCP FEIS Vol. II p. 2-48).*

- Close roads and trails to the extent possible following the proposed activities to reduce the potential for unauthorized motor vehicle use and/or loss of snags to firewood gathering.

- Use a combination of topography, group retention, and roadside vegetation to reduce sight distances within harvest units where feasible.

Roads:

- A transportation system minimizing road miles and meeting Best Management Practices (BMPs) has been designed by the DNRC. The existing roads will be utilized in the project area and new roads will be constructed to minimized road density and still access the majority of the acres in the section.

Soils:

- Limit ground based equipment operations to periods when soils are relatively dry, (less than 18%), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features. Check soil moisture conditions prior to equipment start-up.

- On ground skidding units, the logger and sale administrator will agree to a general skidding plan prior to equipment operations. Skid trail planning would identify which main trails to use, and what additional trails are needed. Trails that do not comply with BMPs (i.e. draw bottom trails) would not be used and may be closed with additional drainage installed where needed or grass seeded to stabilize the site and control erosion.

- Tractor skidding should be limited to slopes less than 35% unless the operation can be completed without causing excessive erosion. Short steep slopes above incised draws may require a combination of mitigation measures based on site review, such as adverse skidding to ridge or winch line skidding from more moderate slopes less than 35%.

- Keep skid trails to 20% or less of the harvest unit acreage. Provide for drainage in skid trails and roads concurrent with operations.

- Slash Disposal- Limit disturbance and scarification combined to 30-40% of harvest units. Consider lop and scatter or jackpot burning on steeper slopes. Retain 10 to 15 tons per acre of material 3 inches and larger. Minimize removal of fine (<1/4" diameter) material for nutrient cycling.

Attachment V

Consultants and References

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